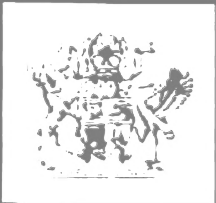


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# AUSTROBAILEYA

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## **JEDDA, A NEW GENUS OF THYMELAEACEAE (SUBTRIBE LINOSTOMATINAE) FROM AUSTRALIA**

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### **Summary**

*Jedda multicaulis* J. Clarkson *gen. et sp. nov.* is described and discussed. It is closely allied to the Asian genus *Linostoma*, and is the first representative of the subtribe *Linostomatinae* recorded from Australia. The species is known only from a small area 50 km west of Laura on Cape York Peninsula.

The subtribe *Linostomatinae* of the Thymelaeaceae as circumscribed by Domke (1934) includes the genera *Lophostoma*, *Enkleia* and *Linostoma*. *Lophostoma* is a South American genus of four species restricted to the Amazon drainage system while the other two genera are Asian. *Linostoma* with three species extends from India through Indochina and the Malay Peninsula to Borneo. *Enkleia* with four species occurs from Burma, Thailand and Cambodia southwards through the Malay Peninsula, Andaman Islands and Sumatra to Bangka and eastwards through Borneo to western New Guinea and the Philippine island of Luzon. The discovery of a new genus from Australia referable to this subtribe is of considerable interest as it adds to the intriguing world distribution of the subtribe. **Fig. 1.**

There has been no recent review of the subtribe *Linostomatinae*. Revisions of *Linostoma*, *Enkleia* and *Lophostoma* were published separately by Nevling in the early 1960's (Nevling 1961a, 1961b, 1963) but the general review foreshadowed in the introduction to the first of these was never published.

***Jedda multicaulis*** J. Clarkson *gen. et sp. nov.*, a ceteris generibus subtribi *Linostomatinarum* habitu multicauli fruticoso, orinatione florenti determinata, bracteis coloratis foliaceis vel foliis bracteaceis in vel sub inflorescentia dispositis et fructu grandissimo distinguenda. **Typus:** Queensland, Cook District: between Jedda Creek and the Kennedy River, 15°37'S, 143°57'E, 18 Oct 1982, J.R. Clarkson 4584 (holotypus BRI 297221, isotypi, A, CANB, DNA, F, K, L, MEL, MO, NSW, PERTH, QRS, SING).

Frutex erectus sempervirens 1.5-2 m altus caulibus pluricentum sparsim ramosis caule tumido subterraneo exorienti. Folia opposita vel subopposita simplicia exstipulata glabra; petioli 3-4(-4.5) mm longi; lamina ovata-elliptica (2.5-)4-6(-7) cm longa 1-2.5 cm lata coriacea discolor; basis cuneata-obtusa; margo intergra; apex acutus-acuminatus; venatio pinnata; venae principales laterales numerosae 6-8 per cm parallelae ± rectae. Inflorescentiae in ramis brevibus in axillis foliorum summorum dispositae, paniculiformes, ramis 3, saepe varie reductae; fasciculi florum determinati, floribus 3(-5), raceformes. Flores ± regulares 5-meri vel subinde 4-6-meri bisexuales; tubus floris cylindricus perigynus 7-9 mm longus ad orificium 1.5 mm latus; lobi calycini 5 raro 4-6 linguiformes-spathulati 6.5-8 mm longi 3-4.5 mm lati; petala respectu numero lobo calycini duplicia, alba anguste clavata 3.7-5 mm longa; stamina numero petalorum aequalia; filamenta filiformia 5-7 mm longa glabra alba; antherae oblongae bicellulares basifixae 1-1.5 mm longae longitudinaliter dehiscentes; ovarium superum breviter stipitatum uniloculare, (cum stipite) 2.5-3 mm longum dense sericeum in dimidio supero; stylus terminalis 15-16 mm longus glaber; stigma capitatum terminale ± papillatum 0.5-0.75 mm diametro; discus annularis squamis irregularibus ca 0.5 mm longis galber. Fructus glabrescens stipitatus irregulariter pyriformis 6-7(-8) cm longus 4-6 cm latus indehiscens interdum viviparus; pericarpium crassum coriaceum viride ubi maturum atrofuscescens sub germinatione; stipes variabilis 1-2 cm longus 1-1.5 cm latus saepe valde recurvus.

Erect, evergreen shrub, 1.5-2 m tall with up to several hundred sparsely branched stems arising from a swollen underground stem; young stems terete, reddish brown, glabrous; lenticels conspicuous, round, becoming ± horizontally elongate. Leaves opposite or subopposite, simple, exstipulate; petiole glabrous, slightly rugose, 3-4(-4.5) mm long; leaf blade ovate to elliptic, widest at or slightly below the middle, (2.5-)4-6(-7) cm long,

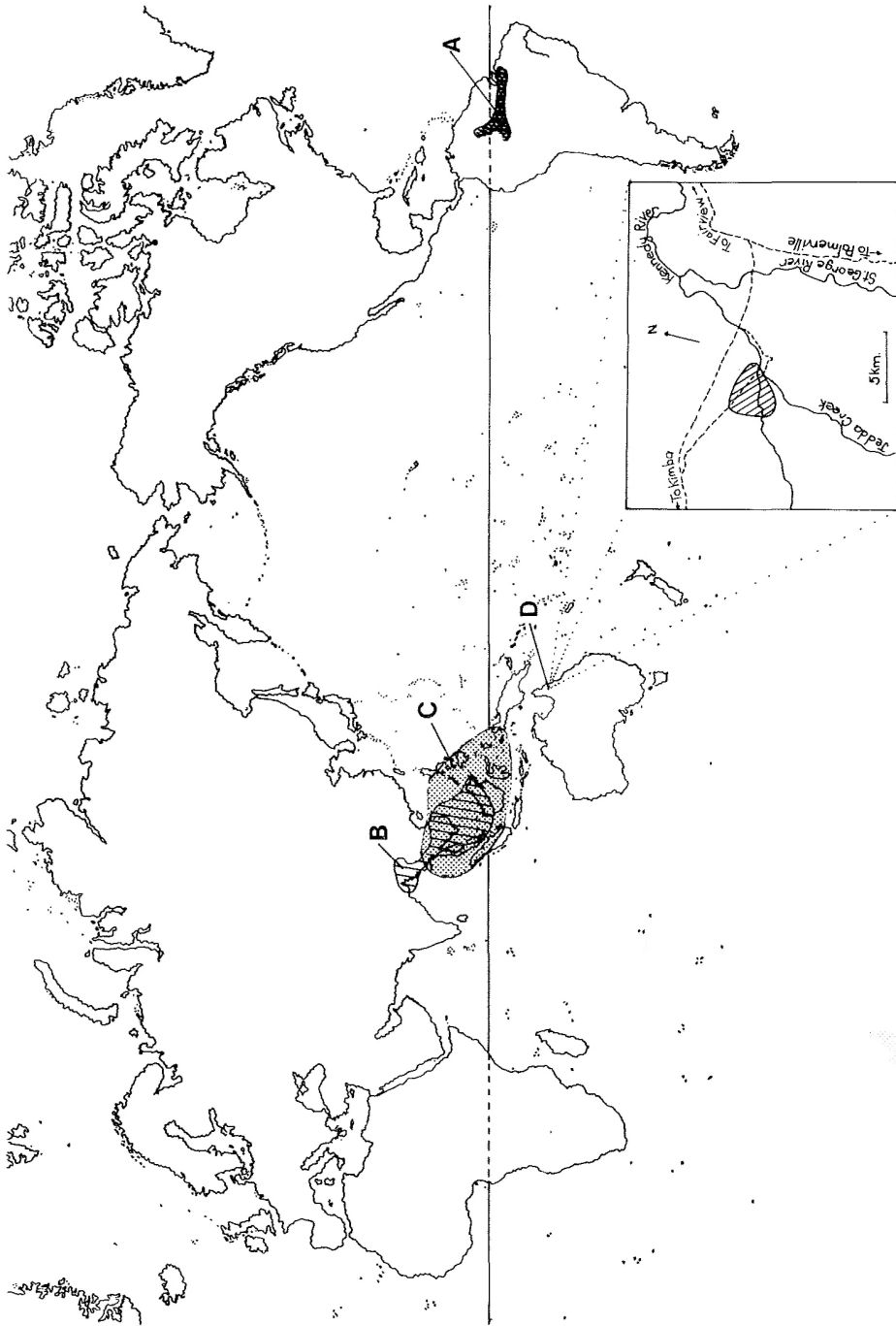


Fig. 1. World distribution of the subtribe *Linostomatinae-Lophostoma* (A), *Linostoma* (B), *Enkleia* (C), *Jedda* (D) and location of only known population of *Jedda multicaulis*.

1–2.5 cm wide, glabrous, coriaceous, discolourous; base cuneate to obtuse; margin entire; apex acute to acuminate; venation pinnate; mid vein plain to impressed above, raised beneath; primary lateral veins numerous, 6–8 per cm, parallel,  $\pm$  straight, terminating in well developed marginal vein; secondary veins anastomosing. Inflorescence on short axillary branches in the uppermost leaf axils, paniculiform, with 3 branches, often variously modified by reduction; subtending leaves much reduced, 2–3 mm long, 1–1.5 mm wide; primary peduncle 3–6 mm long with 1 or rarely 2 pairs of opposite or subopposite bracts, terminated by a pair of opposite bracts; flowers clusters determinate, 3(–5)-flowered, racemiform; rachis much contracted, to 0.5 mm long (often barely perceptible in 3-flowered cluster); secondary peduncle extremely short, at most 0.5 mm long; uppermost flower single, ebractiolate; lower flowers paired, subtended by a single bracteole; bracteole ovate to elliptic, subsessile, 2–4 mm long, 1–1.5 mm wide; pedicel with a clearly marked articulation at the base where it joins the secondary peduncle, glabrous, 4–4.5 mm long, enlarging in fruit to 10 mm long  $\times$  8 mm wide. Flowers  $\pm$  regular, 5-merous or occasionally 4–6-merous, bisexual, sweetly perfumed; floral tube cylindrical, perigynous, 7–9 mm long, 1.5 mm wide at the orifice, pale green, glabrous except for a few downward facing trichomes inserted on the inner surface between the whorls of stamens and corolla lobes, longitudinally and unilaterally ruptured by the developing fruit, persistent at the base of the mature fruit; calyx lobes 5, rarely 4–6, quincuncial in bud when 5 otherwise imbricate, subequal, outer 3 somewhat broader and more hooded than inner 2, linguiform to spatulate, 6.5–8 mm long, 3–4.5 mm broad, slightly shorter than the floral tube, glabrous, pale green, strongly reflexed at anthesis, closing after pollination; petals twice the number of calyx tube, narrowly clavate, somewhat fleshy, 3.7–5 mm long, erect and spreading at anthesis; apex of petals irregular; stamens equal in number to the petals and somewhat longer than them, inserted in a single whorl below the petals, erect and spreading at anthesis; filaments filiform, enlarging slightly distally, 5–7 mm long, glabrous, white; alternisepalous filaments shorter than the antisepalous filaments by about half the length of an anther in the mature bud,  $\pm$  equal in length by anthesis; anthers oblong, 2-celled, basifixed, 1–1.5 mm long, longitudinally dehiscent; connective produced slightly beyond the anther cells; pollen polyporate, highly sculptured, 60–65  $\mu$ m diameter; ovary superior, shortly stipitate, unilocular with a single anatropous ovule attached to the upper lateral wall; ovary and stipe 2.5–3 mm long, densely sericeous in the upper half; style terminal, 15–16 mm long, glabrous; stigma capitate, terminal,  $\pm$  papillate, 0.5–0.75 mm diameter; disc annular, with irregular scales ca 0.5 mm long, glabrous. Fruit glabrescent, stipitate, irregularly pyriform, 6–7(–8) cm long, 4–6 cm wide, indehiscent, occasionally viviparous; pericarp thick, leathery, green when mature, turning dark reddish brown at germination; stipe variable, 1–2 cm long, 1–1.5 cm wide, often strongly recurved. Seed lacking endosperm; cotyledons fused, fleshy, occupying almost entire volume of seed. **Fig. 2.**

**Etymology:** The generic name is taken from Jedda Creek, a tributary of the Kennedy River. The plant is known only from the vicinity of this stream. The specific epithet refers to the multistemmed habit of the plant.

**Distribution:** Endemic in a small area along Jedda Creek upstream from its junction with the Kennedy River, 50 km west of Laura on Cape York Peninsula. **Fig. 1.**

**Specimens examined.** Queensland. COOK DISTRICT: Apr 1980, Clarkson 3196 (BRI), 3245 (BRI, QRS), Oct 1981, McKeague & Miller s.n. (BRI, CANB, F, K, L, PERTH, QRS), Dec 1981, Clarkson 4188 (AD, BRI, CANB, DNA, F, K, L, MEL, MO, NSW, PERTH, QRS, SING), May 1982, Clarkson 4281 (BRI, QRS), Oct 1982, Clarkson 4584 (A, BRI, CANB, DNA, F, Q, L, MEL, MO, NSW, PERTH, QRS, SING), Sep 1983, Clarkson 5005 (BRI, CANB, K, L, MEL, QRS), Nov 1983, Clarkson 5031 (BRI, K), Jan 1984, Clarkson 5121 (BRI, QRS).

**Habitat:** The plant occurs in *Eucalyptus tetradonta* open forest on flat to gently undulating sandy red earth. Associated tree species include *Eucalyptus nesophila*, *E. polycarpa*, *E. dichromophloia* s. lat., *Erythrophleum chlorostachys*, *Grevillea glauca* and *Parinari nonda*.

**Biology:** Flowering occurs in October with the onset of the summer storm activity. Not all plants appear to flower each year. The sweetly scented flowers and the spreading stamens suggest insects may be the major pollinators. Fruits mature by late January to early February with usually only a single fruit developing to maturity in each flower cluster. Germination often occurs while the fruit is still attached to the parent shrub although such vivipary is not obligatory. The germination behaviour is unusual and will be described and discussed in detail elsewhere (Clarkson and Clifford, in prep.). Local property owners suggest that the plant may possibly be toxic to cattle but this has not been confirmed by feeding tests.

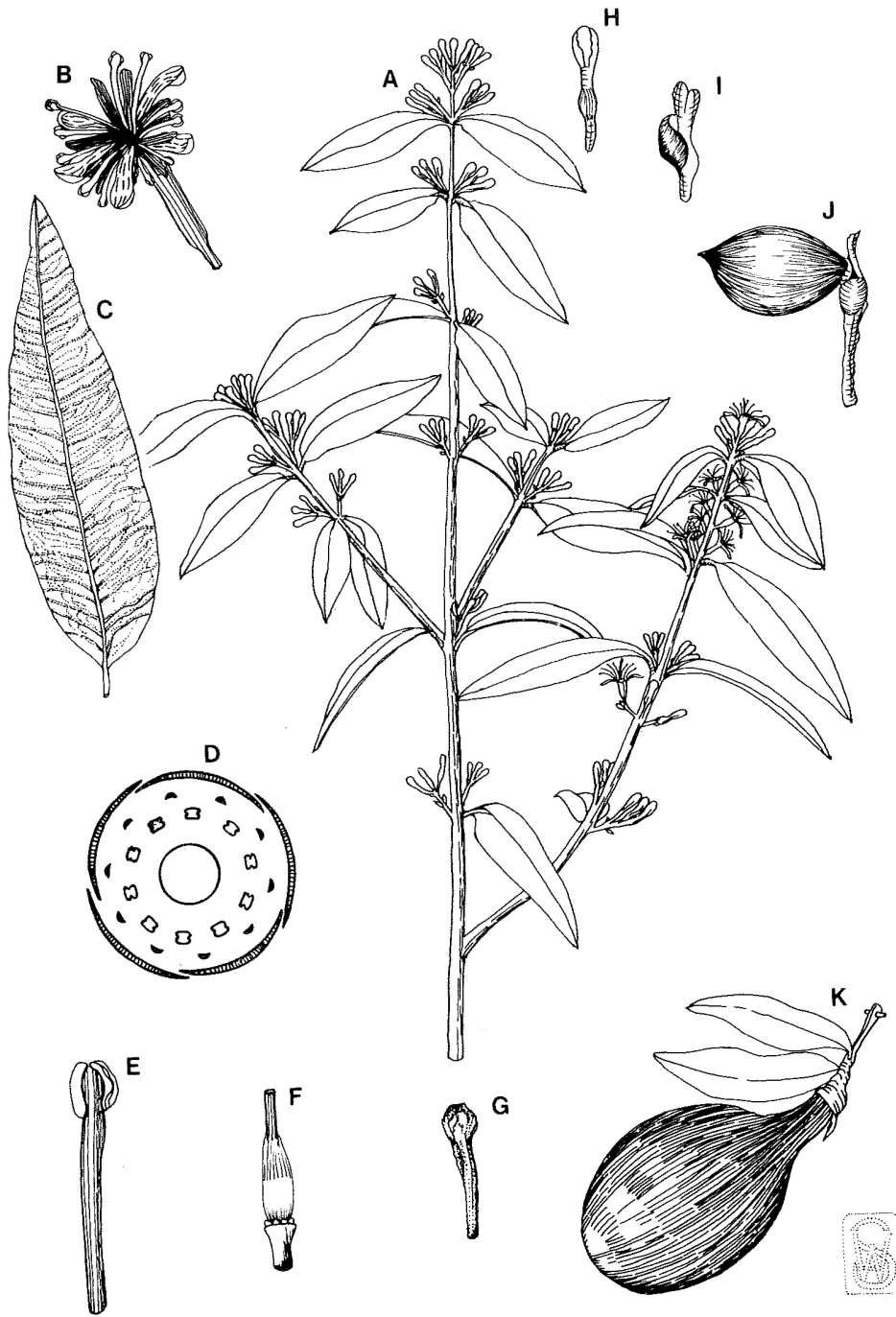


Fig. 2. *Jedda multicaulis*: A. flowering branchlet (Clarkson 4584)  $\times 1/2$ . B. flower (Clarkson 4584)  $\times 1.5$ . C. leaf (Clarkson 4584)  $\times 1$ . D. floral diagram. E. stamen (Clarkson 4584)  $\times 6$ . F. ovary and disk (Clarkson 4584)  $\times 6$ . G. stigma (Clarkson 4584)  $\times 6$ . H-J. developing fruit showing unilateral and longitudinal rupture of floral tube (Clarkson 5031)  $\times 1$ . K. mature fruit (Clarkson 5121)  $\times 1/2$ .

**Conservation Status:** Although locally abundant, the species is known only from a relatively small area probably totalling no more than 5 square kilometres. Present land use does not appear to be adversely affecting the population and it is not likely to change significantly in the foreseeable future. The plant is rather attractive in new growth and may have potential for cultivation as a small specimen shrub or perhaps as a hedging plant if it will respond to the necessary pruning.

*Jedda* is distinguished from other members of the subtribe *Linostomatinae* by its shrubby habit, determinate flowering pattern, lack of coloured foliaceous bracts or bract-like leaves in or below the inflorescence and extremely large fruit which is larger than any known to have been previously described for the Thymelaeaceae. Together with *Linostoma* and *Enkleia* it can be distinguished from *Lophostoma* by the trichomes of the flower which are straight and in which the cell wall is smooth. In *Lophostoma* the cell wall is undulate giving the hairs a somewhat crinkled appearance. The close, parallel pattern of veins in the leaf readily separates *Jedda*, *Linostoma* and *Lophostoma* from *Enkleia* where the primary veins are more widely spaced, arcuate-ascending and the secondary reticulum more pronounced. **Table 1.**

**Table 1. Characteristics of genera of the subtribe *Linostomatinae*.**

|   | <i>Linostoma</i> | <i>Enkleia</i> | <i>Lophostoma</i> | <i>Jedda</i> |
|---|------------------|----------------|-------------------|--------------|
| 1. Number of species  | 3                | 4              | 4                 | 1            |
| 2. Scandent shrubs or lianes  | usually          | usually        | +                 | —            |
| Erect shrubs  | —                | —              | —                 | +            |
| 3. Coloured foliaceous bracts present in or below the inflorescence | +                | +              | +                 | —            |
| 4. Flowering pattern determinate                                    | —                | —              | —                 | +            |
| Flowering pattern indeterminate                                     | +                | +              | +                 | —            |
| 5. Flowers haplostemonous   | 1 sp.            | —              | —                 | +            |
| Flowers diplostemonous  | 2 spp.           | +              | +                 | —            |
| 6. Number of primary veins in K-lobes                               | 3                | 3-5            | 12                | 3            |
| 7. Trichomes of flowers with undulated cell wall                    | —                | —              | +                 | —            |
| Trichomes of flowers with straight cell wall                        | +                | +              | —                 | +            |
| 8. *Fruit large >4 cm diameter                                      | —                | —              | —                 | +            |
| Fruit small <2 cm diameter  | +                | +              | +                 | —            |
| 9. *K-tube accrescent, surrounding mature fruit                     | 2 spp.           | —              | +                 | —            |
| K-tube transversely ruptured by developing fruit                    | —                | 2 spp.         | —                 | +            |
| K-tube longitudinally ruptured by developing fruit                  | 1 sp.            | 1 sp.          | —                 | —            |

\* The fruit of *Enkleia thorelii* is unknown.

On floral characters alone *Jedda* is difficult to distinguish from the Asian genus *Linostoma* but floral features which have been considered diagnostically important in the past and which have been used to separate the genera of the *Linostomatinae* break down in the light of Nevling's work (Nevling 1961a, 1961b, 1963). *Enkleia* has been distinguished from *Linostoma* by having the stamens arranged in two whorls rather than in a single series (Ding Hou 1960; Hutchinson 1967) and by the style being shorter as opposed to longer than the ovary (Domke 1934; Ding Hou 1960; Hutchinson 1967) yet the flowers of both *Linostoma persimile* and *L. pauciflorum* are diplostemonous (Nevling 1961a) and the style of *Enkleia siamensis* subsp. *siamensis* is often much longer than the ovary (Nevling 1961a). The absence of a disc in *Lophostoma* has been considered an important diagnostic character (Domke 1934) but Nevling (1963) confirmed the presence of this structure in at least two species of the genus, *L. calophylloides* and *L. ovatum*. The characters which remain to distinguish the genera are largely non floral and include the nature of the bracts within the inflorescence, the cellular structure of the trichomes associated with the flower, the pattern of leaf venation and the nature of the fruiting calyx. Generic limits within the Thymelaeaceae are however often much narrower than those accepted in many other families. Attention has been drawn to this by several authors including Ding Hou (1960) in his treatment of the family for Flora Malesiana. This treatment of *Jedda* as distinct from the other genera of the *Linostomatinae* is therefore consistent with the generally accepted taxonomic view of the subtribe and is in line with the narrow generic limits commonly encountered in the Thymelaeaceae.

#### Key to the genera of the subtribe *Linostomatinae*

1. Primary lateral veins widely spaced, less than 5 per cm, arcuate-ascending;  
secondary reticulum conspicuous . . . . . **Enkleia**  
Primary lateral veins closely spaced, more than 5 per cm, parallel and  
straight; secondary reticulum inconspicuous . . . . . 2
2. Inflorescence lacking coloured foliaceous bracts, not subtended by coloured  
bract-like leaves; mature fruit greater than 4 cm diameter . . . . . **Jedda**  
Inflorescence with a pair of coloured foliaceous bracts or subtended by  
coloured bract-like leaves; mature fruit less than 2 cm diameter . . . . . 3
3. Calyx lobes with more than 10 primary veins; trichomes of flower  
crinkled . . . . . **Lophostoma**  
Calyx lobes with 3 primary veins; trichomes of flower straight . . . . . **Linostoma**

The inflorescence of *Jedda* appears to be a highly complicated structure the interpretation of which is made difficult by the contraction of the branches and by varying degrees of reduction. A schematic representation of the inflorescence is shown in **Figure 3**. The terminology used follows that applied by Nevling to the inflorescence of *Daphnopsis* and later used by him in his revisions of the genera of the *Linostomatinae*.

There has been considerable debate as to the nature of the internal appendages of the floral tube in some members of the Thymelaeaceae. Heinig (1951) reviewing various interpretations of the origin and morphology of these petal-like organs and on the basis of her own anatomical studies suggested they were stipular appendages of the sepals and considered the flower to be apetalous. More recent work by Bunniger (1972) suggests they are in fact petals thus supporting the view adopted by Nevling (1959) in his revision of *Daphnopsis* and retained by him in his later studies of *Linostoma*, *Enkleia* and *Lophostoma*. No attempt is made here to judge the relative merits of Heinig's or Bunniger's work. On purely practical grounds when examining the flower of *Jedda* these structures will most likely be interpreted as petals but having done so attempts to successfully key the plant to Thymelaeaceae in the key to families in Volume 1 of 'Flora of Australia' will fail. The conversion of couplet 367 (page 135) to a triplet to read as follows will remedy the situation.

|                            |                |
|----------------------------|----------------|
| 367. Ovary 1-locular ..... | Thymelaeaceae  |
| Ovary 3-6-locular .....    | 368            |
| Ovary 10-15-locular .....  | Sonneratiaceae |

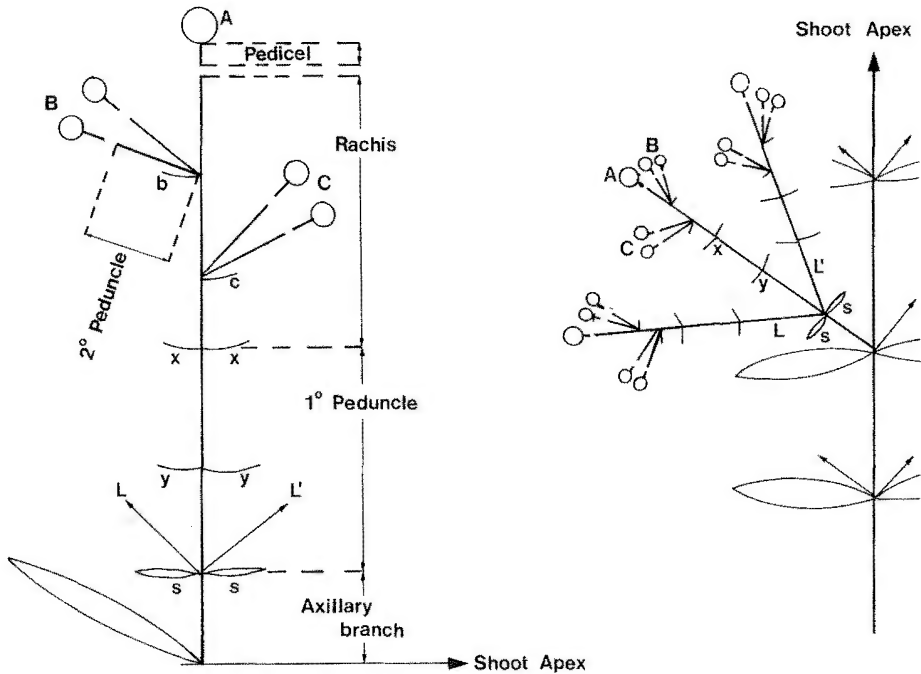


Fig. 3. Schematic representation of the inflorescence of *Jedda multicaulis* showing racemose flower cluster and branching pattern. S = subtending leaves; L, L' = lateral flower clusters; x, y = bracteoles of primary peduncle; b, c = bracteoles of flower pairs B & C; A = terminal flower.

### Acknowledgements

I am indebted to my colleagues for their help and assistance in particular Mr R.J.F. Henderson and Mr L. Pedley of the Queensland Herbarium who offered helpful advice throughout the project and who critically read the manuscript; Prof. H.T. Clifford for arranging sectioning of the flowers and for his enlightening discussions on the structure of the fruit. Dr B. Rye of the Western Australian Herbarium also read the manuscript and drew my attention to the work of Bunniger. Mr P.J. McKeague and Dr C.P. Miller of Department of Primary Industries, Mareeba, collected the first flowering specimen seen and Mr & Mrs G. Raymond of Kimba Station watched the population for some time and advised when it was in flower. Mrs G. Rankin and Mr W. Smith of the Queensland Herbarium prepared the illustrations of the new species. A special acknowledgement is due to Mr John DeCampo for his technical assistance. Thanks are due to the Directors of BRI and L for the loan of material of *Linostoma* and *Enkleia* and to Mr B.P.M. Hyland of CSIRO Atherton for allowing me ready access to the facilities of the QRS herbarium. The Australian Biological Resources Study is acknowledged for funds to support a technical assistant for flora survey work on Cape York Peninsula.



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**PLANICHLOA (POACEAE, CHLORIDOIDEAE,  
ERAGROSTIDEAE)  
A NEW GRASS GENUS FROM NORTHERN QUEENSLAND**

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**Summary**

*Planichloa nervilemma*, a new grass from northern Queensland, is described and its relationships are discussed.

In the Queensland Herbarium there are specimens of a new chloridoid grass species, belonging to the tribe *Eragrostideae*, that have presented problems for some time as to their generic placement. They have been wrongly identified as known species of *Ectrosia* R.Br. and *Heterachne* Benth. at one time or another but closer examination shows the species to be somewhat intermediate between these genera in overall appearance. An essential difference, however, is the presence of 2 or 3 clearly defined lateral nerves on each side of the lemma; these 5-7-nerved lemmas contrast with the 3-nerved lemmas of *Ectrosia* and *Heterachne* and other ectrosioid genera accepted by Decker (1963).

The genera *Ectrosia* and *Heterachne* have been associated in classifications of Poaceae for some time (Bentham 1877; Hackel in Hubbard 1935; Hubbard 1935; Pilger 1956; Phillips 1982). Although originally classified as pooid genera by Bentham and Hackel they were later reclassified as chloridoid grasses (belonging to the tribe *Eragrostideae*) by Hubbard on the basis of their 3-nerved lemmas, the pooids generally having 5-7-nerved lemmas.

If the number of lemma nerves is accepted as the sole criterion for separating pooid and chloridoid genera, the unplaced grass would have to be considered pooid. However, it has been shown that a few chloridoid genera do possess lemmas with 5 or more nerves and they have been moved from the pooids to the chloridoids on the basis of their cytology and leaf anatomy, attributes demonstrated to be of great classificatory value in the study of grasses in recent times (Auquier 1963; Prat 1936, 1960). Examples are the genus *Drake-Brockmania* (Hubbard 1950; Phillips 1974) also in the *Eragrostideae* and the genus *Triodia* of the related tribe *Triodieae*. An examination of the leaf anatomy of the new grass shows it to be typically chloridoid\*. Further chloridoid characters complementary to those of leaf anatomy and cytology are the coriaceous texture of the lemma and a tropical to subtropical distribution, both features of the new Queensland grass.

Other factors that need to be considered in relation to lemma nervation apart from nerve number are (a) nerve definition and (b) nerve spacing and I am grateful to Dr Surrey Jacobs (pers. comm.) for bringing to my attention the following points. The presence of clearly defined nerves 'usually simply means that a plant has Kranz anatomy which results in the nerves appearing more obvious—a useful distinction between Pooids and Chloridoids.' With respect to nerve spacing 'a common nerve patterning sequence in the chloridoid grasses is 9-7-5-3. Three nerves are very common and characteristic of the subfamily. However, a less common state is for the nerves to be grouped in three groups of three (9-nerved). From this state pairs of nerves are lost resulting in the 9-7-5-3 pattern. Several chloridoid species have lemmas with differing numbers of lemma nerves. For example in *Triodia* all of the 9-7-5-3 numbers can be found.'

\*Abaxial leaf epidermis: Microhairs present, distal hairs tapering; mid intercostal cells with sinuous walls, lacking papillae; stomata with triangular subsidiary cells; silica bodies of the coastal region nodular. Transverse section of the leaf: Bundle sheaths double, the outer thin walled and rich in plastids, the inner thick walled and lacking plastids. Chlorenchyma weakly radiate with 1-2 cells between bundles. Bulliform cells occurring in discrete fan-shaped groups but not penetrating the leaf.

The lateral lemma nerves of the new grass are more or less grouped together (Fig. 4) as in some species of *Triodia*. However, the nerves of the latter species are more tightly and evenly grouped whereas the lemmas of the new grass have a greater interspace between the second and third nerves than between the third and fourth, when present. The situation in species of *Drake-Brockmania* with 5–7 nerves (Fig. 58 in Phillips 1974) is such that there is a more even distribution between the nerves although the first interspace is still greater than the second.

In view of the fact the new species cannot be placed satisfactorily in either *Ectrosia* or *Heterachne*, because of the 5–7-nerved lemma, it seems appropriate either to unite the whole complex or to accord this intermediate taxon generic rank. I feel it is better to opt for the latter choice as an enlarged genus would incorporate elements of too great a magnitude morphologically. Furthermore, the fairly open panicle of the new grass contrasts with the congested to contracted panicles found in most species of *Heterachne* and *Ectrosia*. The two exceptions to the latter condition are in *Ectrosia agrostoides* Benth. and *Heterachne baileyi* C.E. Hubbard. In the former the spikelets are much smaller and narrower in relation to their length than in the new grass and in the latter the spikelets are not awned.

**Planichloa** (*Chloridoideae*, *Eragrostideae*) B. Simon, **gen. nov.** affinis *Heterachnae* Benth. et *Ectrosiae* R.Br. sed lemmate 5–7-nervi, affinis *Drake-Brockmaniae* Stapf sed nervis lemmatum glabris differt. **Typus:** *P. nervilemma* B. Simon

Annual, culms erect, simple. Leaf blades linear, flat or folded; ligule a hair-fringed membrane. Inflorescence a contracted to open panicle with spikelets solitary and produced on secondary, or less often primary branches and disarticulating at maturity above the glumes that subsequently themselves fall off, leaving the short hairy pedicels and inflorescence branches. Spikelets markedly laterally compressed, narrowly ovate to ovate, consisting of 2–8 florets on a rigid non-fragmenting rachilla. Glumes lanceolate, acuminate, scaberulous on the margins and keel, usually mauve; lower glume 1-nerved, slightly shorter than the 3-nerved upper glume. Lemmas acute to acuminate to awned, longer awns towards the spikelet apex, rigid and flattened on a central scaberulous winged keel, 5–7-nerved, yellowish green and occasionally infused with mauve at the apices, with a zone of darker pigmentation associated with the lateral nerves, the margins scaberulous. Paleas comma-shaped, *ca* half the lemma length, hyaline with two winged keels, the margins scaberulous and coriaceous. Anthers 3, mauvish red; stigmas pale yellow, plumose; lodicules 2, cuneate. Caryopsis slightly laterally compressed with the embryo *ca* half as long; hilum basal, *ca* 1/4 the length of the caryopsis.

Species 1, from northern Queensland.

**Planichloa nervilemma** B. Simon, **sp. nov.**

Gramen, annum, gracile, 12–40 cm altum. Culmi, folia et rami inflorescentiae pilis tuberculatis. Inflorescentia 6–12 cm × 1.5–3 cm; ramis primariis ad 8 mm longis; rami et axes scaberi triqueti. Spiculae 5–11 mm × 3–6 mm. Gluma inferna 2.5–4 mm longa; gluma superna 3–4.5 mm longa. Lemmata 3–6.5 mm longa (includens aristam, si praesentiam). Paleae 2–3 mm longae. **Typus:** Queensland, Cook District: *ca* 20 km SE of Laura on the Peninsular Development Road, 15°39'S, 144°33'E, 25 Apr 1983, J.R. Clarkson 4679 (holotypus BRI; isotypi CANB, DNA, K, NSW, PERTH, QRS).

A slender annual 12–40 cm tall. Culms terete, 1–3-noded; culms, leaf sheaths and blades and inflorescence branches hispid with tubercle-based hairs 1–2 mm long, denser at the auricles. Leaf sheaths and blades with ribbed nerves, sheaths shorter than the culm internodes, blades 2–10 cm × 0.1–0.4 cm, acute to acuminate; ligule 0.2–0.3 mm long. Inflorescence 6–12 cm × 1.5–3 cm, the axis scabrous and triquetrous; primary branches to 8 mm long, scabrous and triquetrous; pedicels 0.5–1 mm long. Spikelets 5–11 mm × 3–6 mm. Lower glume 2.5–4 mm long; upper glume 3–4.5 mm long. Lemmas 3–6.5 mm long (including the awn if present). Paleas 2–3 mm long. Anthers *ca* 0.5 mm long, mauvish-red. Caryopsis *ca* 1.4 mm × 0.8 mm, smooth, yellowish-brown. **Figs 1–6.**

**Etymology:** The generic name alludes to the very flattened spikelets and the specific epithet to the lemmas with their sharply defined nerves.

The species is restricted to the Cook Pastoral District of northern Queensland and is found only on sandy soils usually with a high species diversity of annual grasses.

QUEENSLAND HERBARIUM: BRISBANE  
 FLORA OF QUEENSLAND  
 15 39 144 33 100 m. det. COOK DISTRICT  
 coll. J.R. Clarkson 4679 25 April 1983  
 Heteractine  
 Family: Poaceae  
 GRASS  
 1.2 km S of Kennedy Creek on the Peninsula Development Road, ca 18.6 km S of Laura.  
 Melaleuca viridiflora woodland with  
 Petalostemum banksii and Acacia umbellata.  
 A common grass by the roadside.  
 Duplicates: QRS, K, CANB, NSW, Perth, DNA.

394400

*Planichloa nervilemma* R. & S. Simon

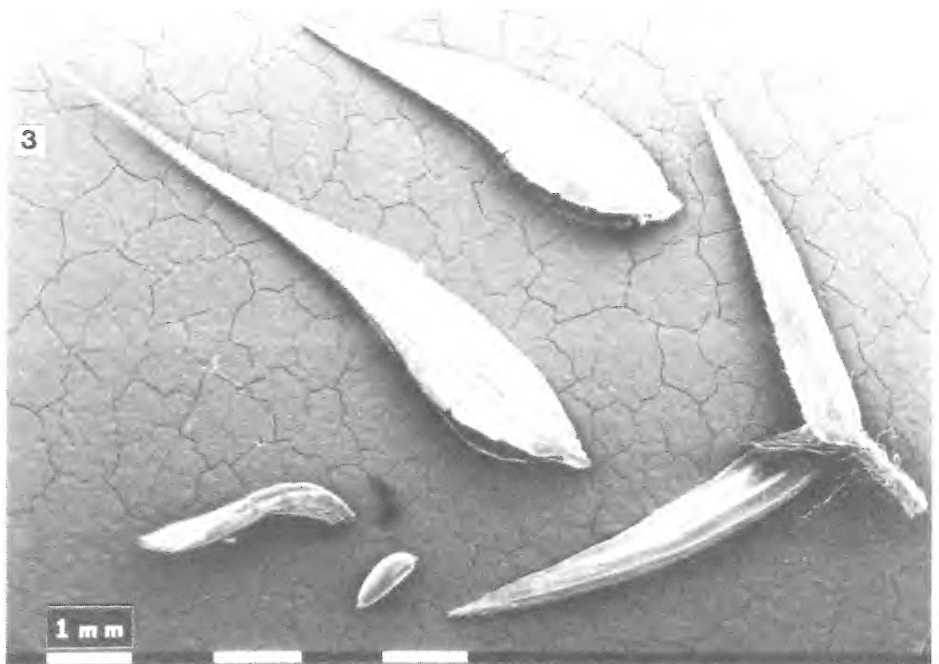
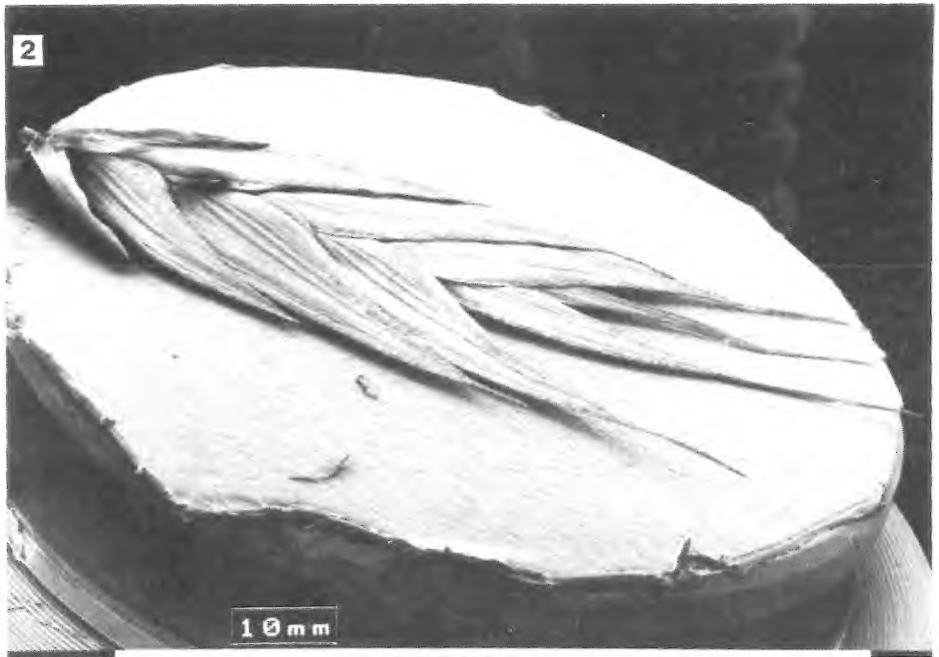
det. B. Simon 20/8/1985

Herb. BRI

HOLOTYPE



Fig. 1. Holotype of *Planichloa nervilemma*.



**Fig. 2.** *Planichloa nervilemma*. Spikelet viewed obliquely from the side (from Clarkson 4679).

**Fig. 3.** *Planichloa nervilemma*. Parts of a dissected spikelet showing a) glumes, b) basal lemma, c) apical lemma, d) palea and e) grain (from Clarkson 4679).

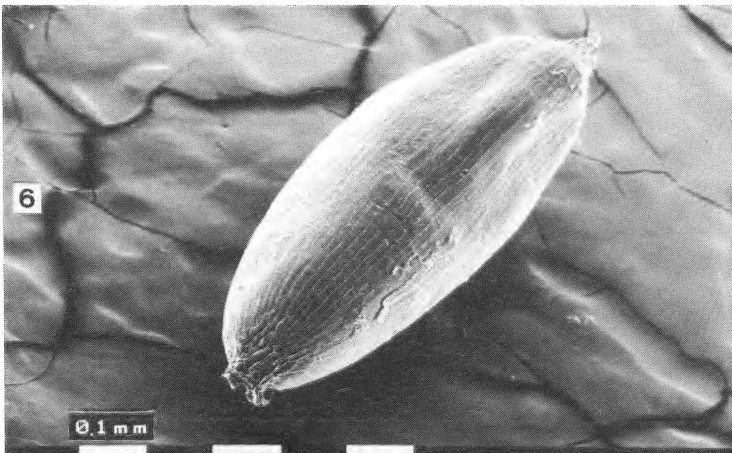
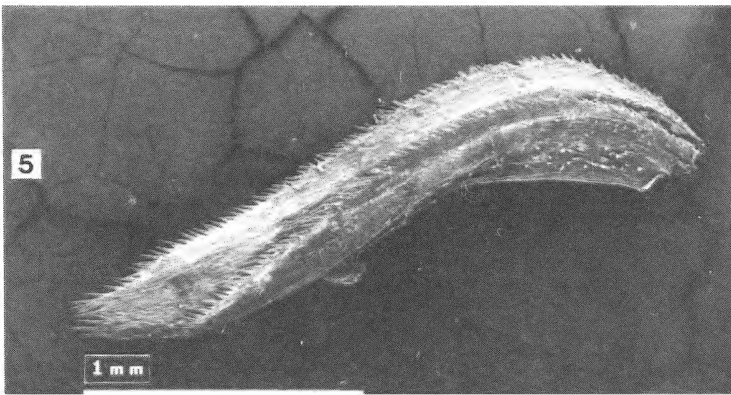
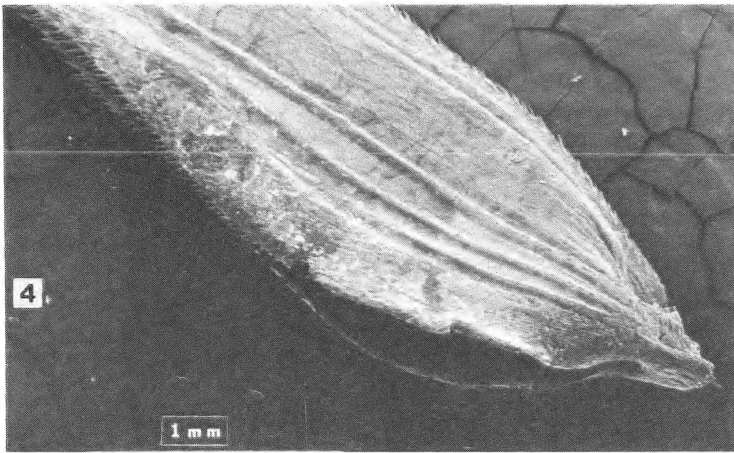


Fig. 4. *Planichloa nervilemma*. Lemma, side view (from Clarkson 4679).

Fig. 5. *Planichloa nervilemma*. Palea (from Clarkson 4679).

Fig. 6. *Planichloa nervilemma*. Grain (from Clarkson 4679).

In one of the sites where it was collected (30 km north of Mareeba) there were as many as 20 other grasses associated with it belonging to the genera *Schizachyrium*, *Thaumas-tochloa*, *Ectrosia*, *Eriachne*, *Pseudopogonatherum*, *Ischaemum*, *Chloris*, *Eragrostis*, *Sacciolepis*, *Heterachne*, *Dactyloctenium* and *Paspalidium*.

**Specimens examined** (all BRI). **Queensland.** COOK DISTRICT: 102 km N of Laura, May 1967, *Symon* 4806 (also ADW, NT); near Cooktown, May 1970, *Blake* 23339; 1 km W of airport, Cooktown, Apr 1975, *McDonald* 1549 & *Batianoff*; near Little Laura R., May 1975, *Byrnes* 3278; ca 37 km SW of Cooktown, 15°42'S, 145°28'E, Apr 1973, *Henderson* 1626; 7 km NW of Nolan Creek on Chillagoe-Wrotham Park road, 16°45'S, 144°05'E, Mar 1980, *Simon* 3585 & *Clarkson* (also CANB, K, L, MBA, NSW); 30 km N of Mareeba on Mt Molloy road, 16°47'S, 145°22'E, May 1975, *Simon* 2654, *Clarkson* & *Staples* (also CANB, K).

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Thanks are extended to colleagues Professor H.T. Clifford of the Botany Department, University of Queensland, for the description of the leaf anatomy, to Dr S.W.L. Jacobs of the New South Wales National Herbarium and Mr R.J.F. Henderson of the Queensland Herbarium for critically reading and suggesting improvements to the manuscript and to Mr H. Dillewaard of the Queensland Herbarium for the photograph of the holotype and the S.E.M. photomicrographs of the spikelets and spikelet parts taken with the Indooroopilly Agricultural Research Laboratories Philips SEM 505 scanning electron microscope.

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## FOUR NEW SPECIES OF *IPOMOEA* L. (CONVOLVULACEAE) FROM AUSTRALIA

R.W. Johnson

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## Summary

Four species, *Ipomoea antonschmidii*, *I. argillicola*, *I. polpha* and *I. saintronanensis* are described as new.

This paper is a precursor to a revision of the genus *Ipomoea* in Australia. Because of the economic interest in two of the undescribed species, publication of their names prior to the revision is considered necessary.

***Ipomoea antonschmidii*** R.W. Johnson, **sp. nov.** affinis *I. velutina* R.Br., sed sepalis ovato-lanceolatis, acutatis, dense hirsutis. **Typus:** Queensland, Burke District: 5 km south-west of Lake Julius pump station, 19 Jan 1984, *A. Schmid* 756 (holotypus BRI 336512).

Planta perennis. Caules repentes, herbacei, dense hirsuti; pili simplices vel bifurcati. Folia simplicia; lamina ovata, acuta vel obtusa, mucronata, cordata, 5-9 cm longa, 3.5-7.5 cm lata, utrinque dense hirsuta; petiolus 2.5-5 cm longus. Inflorescentia axillaris, cymosa; pedunculus 2-5.5 cm longus, 1-3-floribus; bractae persistentes, subulatae ad peranguste ellipticae, 1-2 cm longae; pedicelli 5-15 mm longi, glandibus distalibus. Sepala exteriora ovata, acuminata ad lanceolata, acuta, 18-21 mm longa, dense hirsuta, 5-nervis elevatis longitudinalibus. Corolla infundibuliformis, purpurea, fauce saturatiore, 5-6 cm longa, glabra, limbus 5-6 cm latus. Stamina 5; filamenta inaequalia, 17-27 mm longa, 10-12 mm supra basin corollae inserta. Ovarium ovoideum, 2-loculare; stylus 35-40 mm longus. Capsula globoso-ovoidea, base styli persistenti, 2-loculare, ca 10 mm alta. Semina 4, ca 5 mm longa, modice ad dense pubescentes, caespitae longorum pilorum ad hilum.

Perennial plant. Stems trailing, herbaceous, densely hirsute; hairs simple or bifurcate. Leaves simple; blade ovate, acute or obtuse, mucronate, cordate, 5-9 cm long, 3.5-7.5 cm broad, densely hirsute on both sides; petiole 2.5-5 cm long. Inflorescence axillary, cymose; peduncle 2-5.5 cm long, 1-3-flowered; bracts persistent, subulate to very narrowly elliptic, 1-2 cm long; pedicels 5-15 mm long, bearing glands at the distal end. Outer sepals ovate, acuminate to lanceolate, acute, 18-21 mm long, densely hirsute, with 5 raised longitudinal veins; inner sepals of equal length but broader. Corolla funnel-shaped, purple with a darker throat, glabrous, 5-6 cm long, limb 5-6 cm broad. Stamens 5; filaments unequal, 17-27 mm long, affixed 10-12 mm above the base of the corolla. Ovary ovoid, 2-locular; style 35-40 mm long. Capsule globular-ovoid with a persistent style base, 2-locular, ca 10 mm high. Seeds 4, ca 5 mm long, moderately to densely pubescent with a tuft of long hairs at the hilum. **Fig. 1.**

**Queensland** (all BRI). BURKE DISTRICT: Ca 5 km SW of Lake Julius Pump Station on pipeline road, Feb 1978, *Schmid* AS430; Jan 1984, *Schmid* 756.

This species is currently known only from a restricted area SW of Lake Julius Dam, NNE of Mt Isa, where it grows on shallow, red, stoney soils in *Eucalyptus leucophloia* woodland. It is not known to occur in any areas protected by statute.

**Etymology:** The species is named in honour of Mr Anton Schmid who first brought it to my notice and who provided me with ample material for study.

***Ipomoea argillicola*** R.W. Johnson, **sp. nov.** affinis *I. muelleri* Benth. sed pedunculis et pedicellis longioribus et corollis magnis. **Typus:** Queensland, Leichhardt District: 1 mile west of Emerald, 17 Feb 1960, *R.W. Johnson* 1321 (holotypus BRI 030678).

Perennis, radice tuberanti. Caules repentes, herbacei, glabri. Folia simplicia; lamina late ovata ad fere reniformis, obtusa, emarginata, mucronulata, cordata ad truncata, 3-12 cm longa et lata; petiolus 2-20 cm longus, lamina plerumque longior, glandibus prominentibus distalibus. Inflorescentia axillaris, cymosa; pedunculus 3-15 cm longus, 1-7-



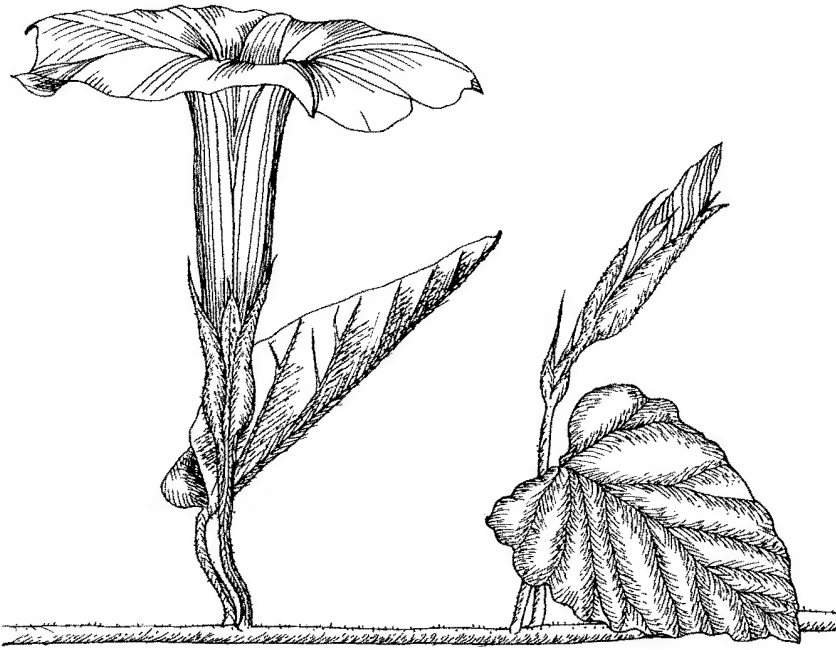


Fig. 1. *Ipomoea antonschmidtii*: habit with inflorescence (Schmid 756)  $\times 1$ .

floribus; bractae paribus oppositis, triangulae, acutae, 2–15 mm longae; pedicelli 1.5–11 cm longi, glandibus prominentibus distalibus. Sepala exteriora ovata ad ovato-oblonga, obtusi-acuta ad obtusa, mucrone prominenti recurvo, 11–22 mm longa, 5–10 mm lata, nervis 3–5, elevatis, longitudinalibus,  $\pm$  tuberculatis in dimidio inferiore; interiora ovata, longitudine exteriora aequantes. Corolla infundibuliformis, alba ad lilacina, fauce purpurea, 4–6 cm longa, limbus 4–5 cm latus, taeniae meso-petalinae acuminibus prominentibus. Stamina 5; filamenta inaequalia, 14–22 mm longa, 6–9 mm supra basin corollae inserta. Ovarium ovoideum 2-loculare; stylus 17–23 mm longus. Capsula ovoidea ad depresso-globulosa base styli persistenti, 2-locularis, 10–16 mm alta. Semina 4, dense pubescentes, 8–8.5 mm longa.

Perennial with a tuberous root. Stems trailing, herbaceous, glabrous. Leaves simple; blade broadly ovate to almost reniform, obtuse, emarginate, mucronulate, cordate to truncate, 3–12 cm long and wide; petiole 2–20 cm long, usually longer than the blade with prominent glands at the distal end. Inflorescence axillary, cymose; peduncle 3–15 cm long, bearing 1–7 flowers; bracts in opposite pairs, triangular, acute, 2–15 mm long; pedicels 1.5–11 cm, with prominent glands at the base of the calyx. Outer sepals ovate to ovate-oblong with 3–5 raised longitudinal nerves,  $\pm$  tuberculate on the lower half, bluntly acute to obtuse, with a prominent recurved mucro, 11–22 mm long, 5–10 mm broad; inner sepals ovate, equalling the outer in length. Corolla funnel-shaped, white to pale violet, with a purplish throat, 4–8 cm long, limb 4–5 cm diameter, mid-petaline bands projected into a prominent acumen. Stamens 5; filaments unequal, 14–22 mm long, affixed 6–9 mm above the base of the corolla. Ovary ovoid, 2-locular; style 17–23 mm long. Capsule ovoid to depressed-globular with a persistent style base, 2-locular, 10–16 mm high. Seeds 4, densely pubescent, 8–8.5 mm long. Fig. 2.

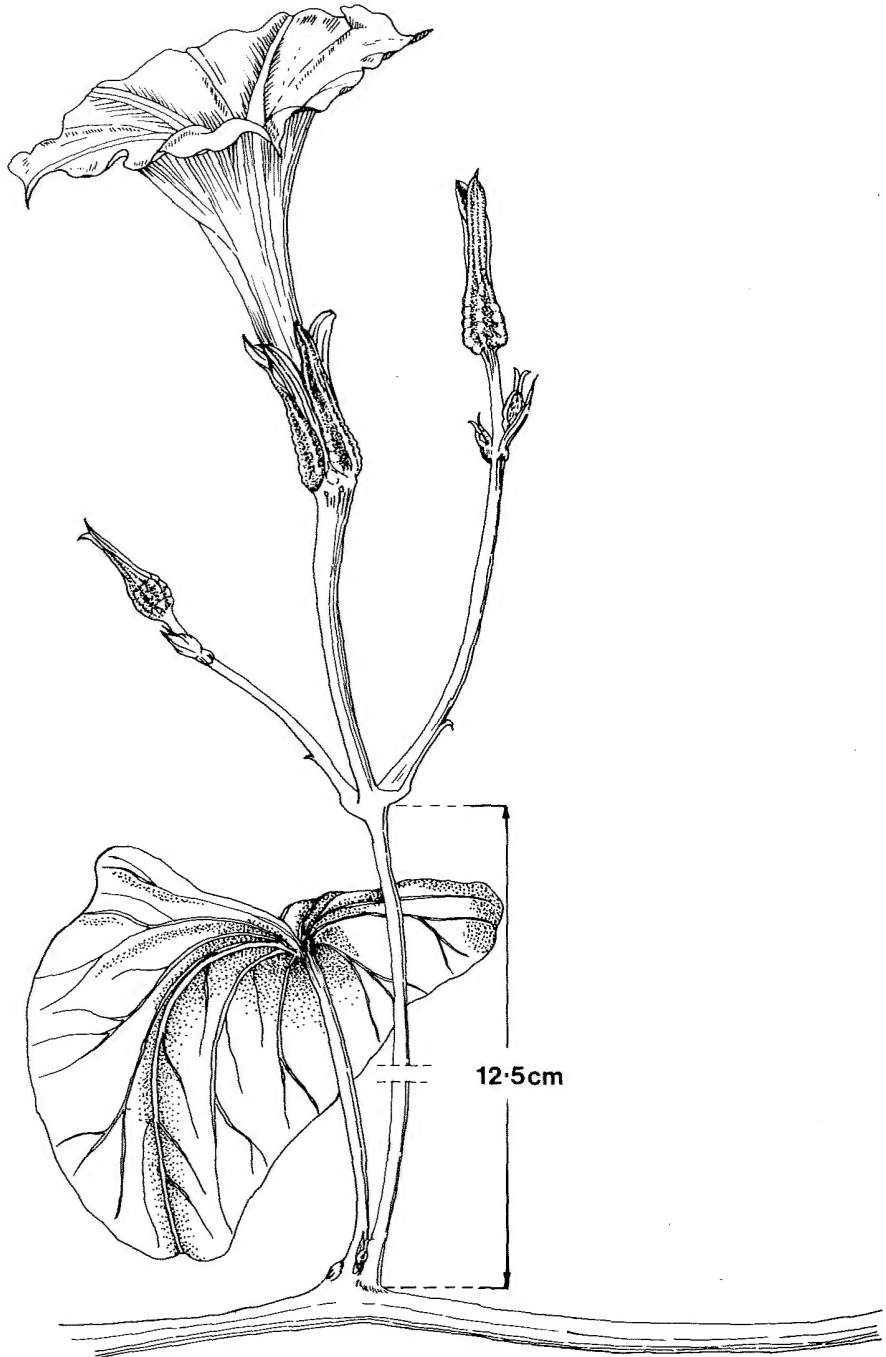


Fig. 2. *Ipomoea argillicola*: habit with inflorescence (Calway AQ378848)  $\times 1$ .

Queensland (all BRI). BURKE DISTRICT: Dagonally, ca 100 km NW of Julia Creek, Apr 1954, *Everist* 5331; Lydia Downs, ca 45 miles [75 km] NW of Maxwellton, Jan 1966, *Pedley* 1965; Sutherland, 45 miles [75 km] NW of Maxwellton, Jan 1966, *Pedley* 1950; near Ranmoor, 35 km N of Richmond, no date, *Byrnes* 3065; Hughenden, Apr 1971, *Birch* 71/77; Richmond, Nov 1928, *Pollock* [AQ276632]\*; 30 miles [50 km] S of Julia Creek, Mar 1959, *Sillar* 3. MITCHELL DISTRICT: Kalleroo Station, near Prairie, Feb 1980, *Byrnes* 3944; 22 km NNE of Blackall on Jerico Rd, Apr 1981, *Wilson* 3502; *Payne*, 1958, *Mackenzie* [AQ276636]. LEICHHARDT DISTRICT: Wyntoon, 20 miles [33 km] NE of Springsure, Jan 1966, *Smith* [AQ276631]; Burton Downs, May 1978, *Johnson* [AQ266045]; ca 1 mile [1.5 km] W of Emerald, Feb 1960, *Johnson* 1321. Northern Territory: 15 miles [25 km] NW of Alexandra H.S., Mar 1956, *Chippendale* 1949. Cultivated: (from seed collected at Wongan, NW of Longreach) *J. Calway* [AQ378848].

This species occurs on the grey cracking clay soils which form extensive sheets in an area from central Queensland to the Barkly Tableland in the Northern Territory. These clays support Mitchell grass (*Astrebla* spp.) tussock grasslands and wooded downs.

**Etymology:** The specific epithet refers to the habitat in which this species is found.

***Ipomoea polpha* R.W. Johnson, sp. nov.** **Typus:** Queensland, Cook District: ca 3.5 km N of Walkamin on road to Mareeba, 30 Jan 1980, *J.R. Clarkson* 2754 (holotypus BRI 275448).

Perennis radice tuberanti. Caules repentes, herbacei, glabri. Folia simplicia; lamina ovata ad ovato-lanceolata, obtusa, basi rotundata ad parum cordata, 5–18 cm longa, 3–9 cm lata, sparsim pilosa. Inflorescentia axillaris, cymosa; pedunculi 3–22 cm longi, 1–5-floribus, interdum pluribus; bracteae caducae; pedicelli 10–50 mm longi, glandibus prominentibus distalibus. Sepala exteriora ovata, ± glabra obtusa, mucronata, 10–15 mm longa, 5–8 mm lata, interiora similares sed parum magiore. Corolla infundibuliformis, rubro-purpureus, fauce et taeniis meso-petalinis saturatioribus, 7–8.5 cm longa, limbus 8–9.5 cm latus. Stamina 5; filamentis inaequalia, 20–32 mm longa, 9–10 mm supra basin corollae inserta. Ovarium ovoidium, 2-loculare, stylus ca 4 cm longa. Capsula ovoidea basi styli persistenti, 2-locularis, 15–18 mm alta. Semina 4, glabri vel sparsim pilis, 10–12 mm longi.

Perennial with tuberous root. Stems herbaceous, trailing, glabrous or sparsely hairy. Leaves simple, petiolate; blade ovate to ovate-lanceolate, obtuse, rounded to slightly cordate at the base, 5–18 cm long, 3–9 cm broad, sparsely hairy. Inflorescence axillary, cymose; peduncle 3–22 cm long, bearing 1–5 flowers, occasionally more; bracts caducous; pedicel 10–50 mm long with prominent glands at the distal end. Outer sepals ovate, ± glabrous, obtuse, mucronate, 10–15 mm long, 5–8 mm broad; inner sepals similar and slightly larger. Corolla funnel-shaped, reddish-purple, midpetaline bands and throat darker, 7–8.5 cm long, limb 8–9.5 cm broad. Stamens 5; filaments unequal, 20–32 mm long, affixed 9–10 mm above the base of the corolla. Ovary ovoid, 2-locular; style ± 4 cm long. Capsule ovoid with a persistent style base, 15–18 mm high. Seeds 4, glabrous to sparsely hairy, 10–12 mm long. **Fig. 3.**

Queensland (all BRI). BURKE DISTRICT: Yarramulla, off Hughenden Rd, in 1977, *Mitchell* [AQ228696]. COOK DISTRICT: Bilboohra, Dec 1935, *Flecker* [AQ276641]; St Ronans Station, Mt Garnet, Dec 1960, *Myers* [AQ276639]; Davies Ck, E of Mareeba, Feb 1963, *Wyatt* 22; Davies Ck forestry access rd, 16 km from Mareeba, Mar 1973, *Broadley* [AQ9236]; Price Creek Rd, 40 km W of Mareeba, Apr 1973, *Halfpapp* [AQ9444]; 10 km S of Mareeba, Dec 1973, *Wyatt* [AQ14041]; Jump-up, 20 km S of Mareeba on Atherton rd, Mar 1977, *Henderson* H2460, *Gray* 346; Palm R. on Great Dividing Ra., Feb 1978, *Hinton* 63; ca 3.5 km N of Walkamin on road to Mareeba, Jan 1980, *Clarkson* 2754. NORTH KENNEDY DISTRICT: 4 miles [6.6 km] S of Inkerman, Oct 1968, *Williams* 224; ca 20 km W of Home Hill, Dec 1973, *Wyatt* [AQ14055]; Home Hill–Bowen rd, ca 17 km from Home Hill, Oct 1974, *Moriarty* 1624; N of Cardwell, Jul 1978, *Collet* A4; Meadowbank Station Rd, 3 km from Kennedy Development Rd, Apr 1980, *Williams* 80013; S of Ravenswood, Mar 1981, *Jacks* 3; ca 100 km NW of Greenvale, Jan 1982, *Pedley* 4826.

This species occurs on red volcanic loams, alluvial clays and red earths and clays associated with lateritic residuals. It is found as a trailing vine in grassy *Eucalyptus* woodlands. The aerial parts are of annual duration and die back in the cooler and drier months to a large tuber which sprouts following the onset of the wet season. The tuber was used as a source of food by native Aborigines.

Specimens collected by P.K. Latz, 8252 (S of Tin Fish Well, Stirling Station, N.T., May–Jun 1979) and B.G. Thomson, 511 (Stirling Range, N.T.) from a population in the Northern Territory appear to belong to this species though further investigation may warrant the erection of a taxon of subspecific rank.

\*This number refers to the computerised collection number situated in the top righthand corner and/or on the label of specimens housed in the Queensland Herbarium. It is distinct from the BRI number which is a sheet number located in the bottom righthand corner.



**Fig. 3.** *Ipomoea polpha*: habit with inflorescence (Henderson H2460)  $\times 1/2$ .

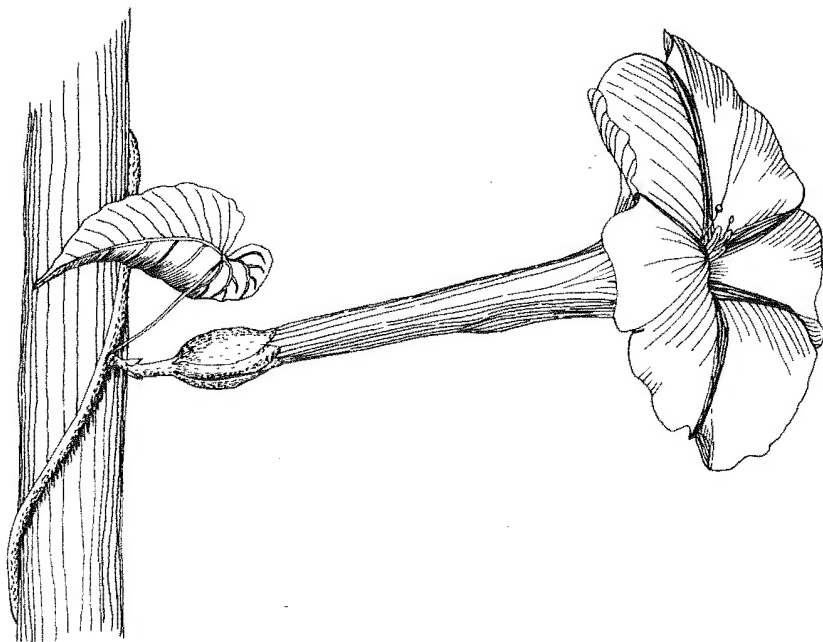
**Etymology:** The specific epithet is derived from the Greek, polphos indicating the value of this species as a source of food.

***Ipomoea saintronanensis*** R.W. Johnson, **sp. nov.** affinis *I. macrantha* Roemer et Schultes sed sepalis pubescentibus et semenibus lanatis. **Typus:** Queensland, North Kennedy District: 40 mile scrub, ca 4 km N of Gulf Development Road turnoff on the Kennedy Highway, 21 Feb 1986, J.R. Clarkson 6332 (holotypus BRI 372925, isotypi BRI, CANB, DNA, K, MEL, MO, QRS, PERTH).

Perennis, deciduus. Caules lignei, volubiles, glabri vel laxe villosi. Folia simplicia; lamina late ovata ad fere orbicularis, breviter acuminata, acuta vel obtusa, cordata, 5–21 cm longa, 5–21 cm lata, supra glabrescens, infra tomentosa; petiolus 3–14 cm longus. Inflorescentia axillaris; pedunculus 10–90 mm longus, flore solitario; bracteae caducae; pedicellus 15–30 mm longus, glandibus distalibus. Sepala exteriora concava, ovata ad orbicularia, 25–35 mm longa, tomentosa, interiora amplitudinis similis. Corolla hypocrateriformis, alba ad pallida rosea; 8–12 cm longa, taeniis meso-petalinis sericeis. Stamina 5; filamenta leviter inaequalia, 9–13 cm longa, 20–30 mm supra basin corollae inserta. Ovarium ovoideum, 2-loculare; stylus 12–16 cm longus. Capsula globulosa, glabra, 2-loculare,  $\pm$  17 mm alta. Semina 4, pilis dense lanatis ad 15 mm longis.

Deciduous perennial liana with woody, twining, glabrous or loosely villous stems. Leaves simple, petiolate; blade broadly ovate to almost orbicular, shortly acuminate, acute, cordate at the base, 5–21 cm long, 5–21 cm broad, becoming  $\pm$  glabrous above, tomentose beneath; petiole 3–14 cm long. Inflorescence axillary; peduncle 10–90 mm long, bearing 1 flower; bracts caducous; pedicel 15–40 mm long, with glands at the distal end. Outer sepals concave, ovate to orbicular, 25–35 mm long, tomentose, inner sepals of similar size. Corolla salverform, white to pale pink, 8–12 cm long, with silky midpetaline bands. Stamens 5; filaments slightly unequal, 9–13 cm long, attached 20–30 mm above the base of the corolla. Ovary ovoid, 2-locular; style 12–16 cm long. Capsule globular, glabrous, 2-locular,  $\pm$  17 mm high. Seeds 4, densely covered with long wavy hairs to 15 mm long.

**Fig. 4.**



**Fig. 4.** *Ipomoea saintronanensis*: habit with inflorescence (Gray 300)  $\times$  1/2.

**Queensland** (all BRI). COOK DISTRICT: St Ronans Station, Dec 1960, *Meyers* [AQ276627]; Lynd scrub, W of Mt Garnet, in 1962, *Webb & Tracey* 7803; dry scrub near Mt Garnet, no date, *Jones* [AQ276628]; Harbour Bridge Cave-Yaramulla Station, Oct 1976, *Williams* 76096; 40 Mile Scrub, Feb 1977, *Gray* 300, Aug 1979, *Clarkson & Byrnes* 2523, Feb 1986, *Clarkson* 6332; 40 Mile Scrub National Park, Feb 1979, *Godwin* [AQ291837].

This species is currently known only from deciduous vine thickets, south-west of Mt Garnet. These thickets are mainly restricted to basaltic soils. This species is adequately conserved within the 40 Mile Scrub National Park.

**Etymology:** The specific epithet is derived from the name of a grazing property, St Ronans, from which this species has been collected. The final s' of the place name has been deliberately omitted to assist pronunciation.

#### Acknowledgements

This work was supported by a grant from the Australian Biological Resources Study. I would like to thank G. Rankin and W. Smith for the illustrations and J. Calway and H. Dillewaard for technical assistance provided.

## THE GENUS *GONIOTHALAMUS* (BLUME) J.D. HOOK. & THOMSON (ANNONACEAE) IN AUSTRALIA

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### Summary

A new species *Goniothalamus australis* from north-eastern Queensland is described thereby extending the known distribution of the genus to Australia.

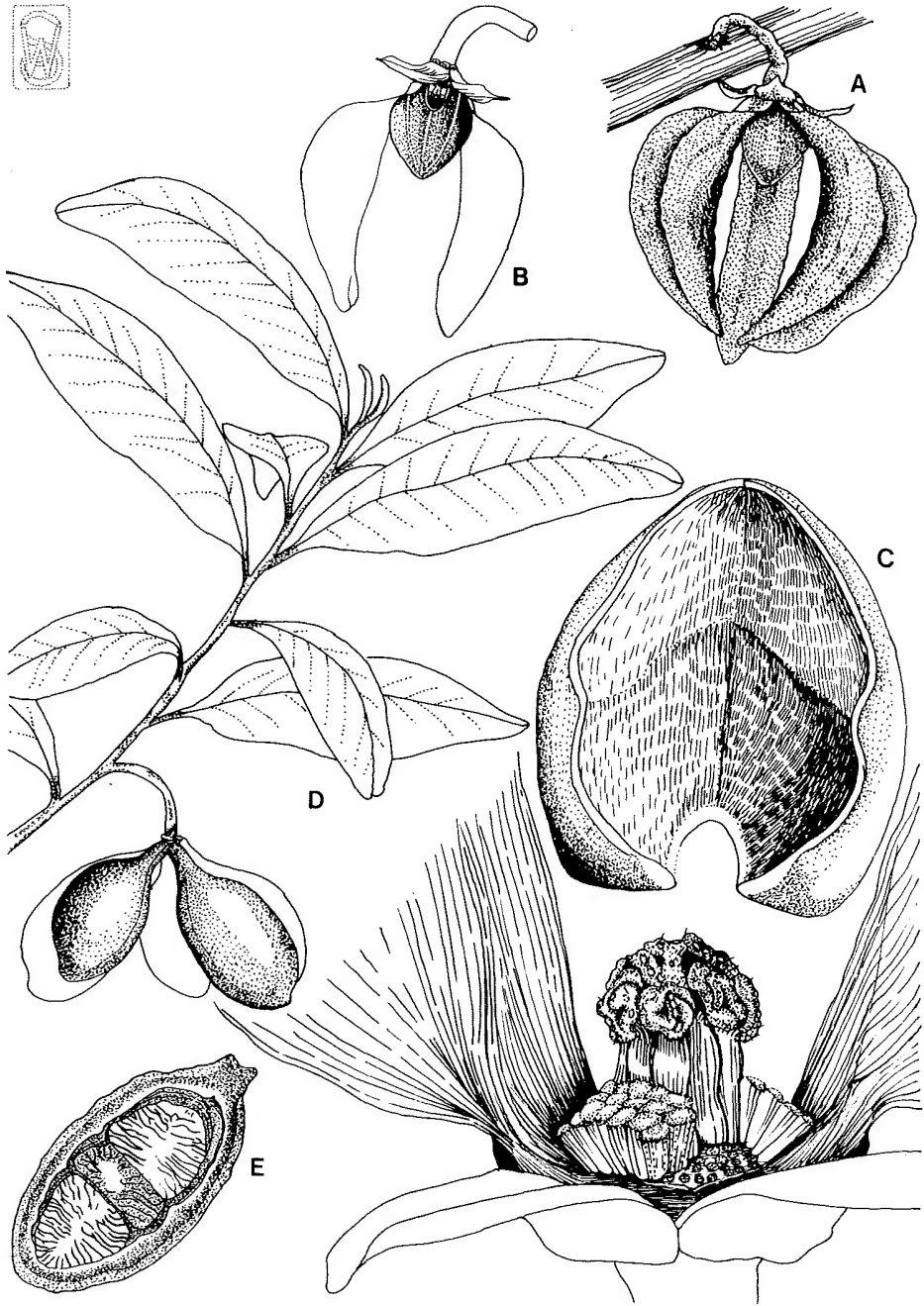
A rainforest tree occurring on the Atherton Tableland and adjacent areas tentatively known since its first collection in 1947 by L.S. Smith and L.J. Webb as *Xylopia* sp. is here described as a new species of *Goniothalamus*.

### *Goniothalamus australis* Jessup, sp. nov.

Arbor usque 30 m alta. Folia obovata, oblongo-obovata vel elliptica, obtusa vel acuminata, supra glabra, infra glabrescentia. Lamina (5-)7-12 cm longa et (2-)3-5 cm lata; basi breviter attenuata; margines leviter recurvatae. Petiolus 3-10 mm longus. Inflorescentia axillaris vel ramala; flores solitari vel bini. Pedicelli 15-20 mm longi; bracteae 3-5, basales. Sepala triangularia vel late ovata, acuta, 7-8 mm longa et 6-6.5 mm lata. Petala extima coriacea, ovata, recurvata lateraliter, incurvata apicale, 25-35 mm longa et 16-21 mm lata, adpressa puberulenta. Petala interiora, trullata vel rhombea, 10-12 mm longa et 7-9 mm lata, externa adpressa puberulenta, margines breviter tomentosa, intra glabra. Stamina 1.4 mm longa; connectiva pulvinata. Carpella plerumque 9-11; ovaria glabra. Ovula 5-7. Stigma infundibuliforma rima intra praedita, hispida. Monocarpia matura oblonga vel ellipsoidea, obtusa vel apiculata, breviter stipitata, 3-6 cm longa et 1.5-2.5 cm lata. Semina oblonga, oblique truncata, ca 2 cm longa; testa laevis, hirtella, rubro-brunnea. **Typus:** Lamins Hill, ca 12 km E of Malanda, Atherton Tableland, 17°23'S, 145°42'E, 12 Dec 1984, L.W. Jessup 764 (holotypus BRI, isotypi A, BRI, K, L, MO, P, QRS, U).

Tree to 30 m high and 45 cm d.b.h., often less than 20 m and 15 cm d.b.h. Outer bark shallowly wrinkled, brown. Shoots appressed pubescent with red-brown antrorse hairs. Branchlets smooth, glabrescent. Leaves obovate, oblong-obovate or elliptic, obtuse or acute with a blunt tip, glabrous above, glabrescent below. Lamina (5-) 7-12 x (2-) 3-5 cm; base shortly attenuate; margins slightly recurved; midvein shallowly channelled above, raised below; secondary veins mostly 9-12 pairs, slightly raised on both surfaces in dry material scarcely visible in fresh material; tertiary and higher order venation reticulate, inconspicuous. Petiole channelled above, 3-10 mm long. Inflorescence axillary or ramal; flowers solitary or paired. Pedicels 15-20 mm long, glabrous or with a few appressed hairs; bracts 3-5, basal, ovate, ca 1 mm long, caducous. Sepals 3, triangular or broadly ovate, acute, 7-8 mm x 6-6.5 mm, glabrescent. Outer petals 3, coriaceous, ovate, laterally recurved, apically incurved, 25-35 mm x 16-21 mm, appressed puberulent. Inner petals 3, trullate or rhombic, 10-12 mm x 7-9 mm, clawed, concave inside, cohering along broad upper margins forming a vaulted cap, appressed puberulent outside, shortly tomentose along margins, glabrous inside. Stamens numerous, oblong, slightly tapered, ca 1.4 mm long, connectives pulvinate at apex, concealing anthers; anthers septate. Carpels mostly 9-11; ovaries  $\pm$  cylindrical with an inside longitudinal groove, straight or slightly curved below apex, 2.5-2.7 mm long, glabrous. Ovules usually 5-7, superposed. Style short, tapering to a funnel-shaped, hispid stigma with an inside slit contiguous with groove in ovary. Margins of slit usually overlapping. Ripe monocarps oblong or ellipsoid, obtuse or apiculate, shortly stalked, 3-6 cm x 1.5-2.5 cm. Seeds oblong, obliquely truncate, ca 2 cm long; testa smooth, hirtellus, red-brown. **Fig. 1.**

Queensland, COOK DISTRICT: Mt Finnigan, (15°47'S, 145°17'E), 25 Aug 1972, Webb & Tracey 12107 (BRI); Mt Hemmant, just N of Noah Creek, (16°06'S, 145°26'E), Jul 1973, Webb & Tracey 11747 (BRI), 11977 (BRI); T.R.142, Zarda L.A., (16°25'S, 145°15'E), Sep 1973, Hyland 6897 (BRI, QRS); near Schillers hut, Mt Spurgeon, (16°26'S, 145°12'E), Sep 1972, Webb & Tracey 11789 (BRI); Mt Misery on Mt Carbine Tableland, (16°27'S, 145°06'E), Sep 1972, Webb & Tracey 11682 (BRI); S.F.R. 143, North Mary L.A., (16°30'S, 145°16'E), Sep 1973, Sanderson 334 (BRI, QRS); S.F.R. 143, South Mary L.A., (16°31'S, 145°15'E), Feb 1979, Gray 1264 (BRI, QRS); end of Mt Lewis rd, (16°35'S, 145°15'E), Aug 1957, Smith 10076 (BRI); Mt Bellenden Ker, 13 Jun 1969, Smith



**Fig. 1.** *Goniothalamus australis*: A. flower (Jessup 764)  $\times 1$ . B. flower with 1 outer petal removed (Sankowsky 291)  $\times 1$ . C. detail of flower, 1 outer petal removed, inner cap detached and 1 petal removed, some stamens removed (Jessup 764)  $\times 6$ . D. habit, in fruit (Jessup 522)  $\times 1/2$ . E. longitudinal section of monocarp (Hamilton, 20 Jan 1975)  $\times 1$ .



14707 (BRI); S.F.R. 310, Gadgarra, (17°15'S, 145°45'E), Oct 1968, *Hyland* 2013 R.F.K. (BRI); S.F.R. 310, Windin L.A., (17°15'S, 145°40'E), Jan 1957, *White* 1326 (BRI); S.F.R. 310, Swipers L.A., (17°15'S, 145°45'E), Mar 1969, *Hyland* 2201 R.F.K. (BRI); Jagan, Malanda-Millaa-Millaa rd, (17°23'S, 145°36'E), Nov 1981, *Gray* 2301, (BRI, QRS); Lamins Hill, junction of Old Boonjie rd and Topaz rd, (17°23'S, 145°42'E), Nov 1982, *Jessup* 522 (BRI); Lamins Hill, ca 12 km E of Malanda, (17°23'S, 145°42'E), Dec 1984, *Jessup* 764 (A, BRI, K, L, MO, P, QRS, U); Nov 1983, *Sankowsky* 291 (BRI); Hosie Rd, Tarzali, (17°25'S, 145°35'E), Jan 1975, *Hamilton* (QRS); T.R. 1230, Boonjie, (17°25'S, 145°45'E), Nov 1972, *Irvine* 409 (BRI, QRS); 18 Dec 1972, *Irvine* 425 (BRI, QRS); along road SE of Tarzali and S of Bartletts Hill (17°26'S, 145°38'E), Feb 1983, *Tracey* 14973 (BRI, QRS); Topaz, near Malanda, (17°26'S, 145°43'E), Aug 1947, *Smith* 3300 & *Webb* (BRI). [S.F.R. = State Forest Reserve; T.R. = Timber Reserve; L.A. = Logging Area].

This species occurs in upland mesophyll and submontane notophyll vine forest in a variety of soil types on the eastern edge of the Atherton Tableland and adjacent mountains north to Mt Finnigan.

The genus *Goniothalamus* (Blume) J.D. Hook. & Thompson consists of about 100 species distributed from China and India, through SE Asia and Malesia to Australia.

Nguyen Tien Ban (1974a, b) classified the genus into 2 subgenera based on the shape of the staminal connective. Unfortunately several species from E Malesia were not included in this classification.

The funnel-shaped stigma and 6–7 ovules in *G. australis* Jessup suggest placement of this species in section *Infundibulistigma* Tien Ban, subsection *Polyspermi* Tien Ban. The 4 species placed in this subsection by Nguyen Tien Ban are *G. philippinensis* Merrill and *G. lancifolius* Merrill from the Philippines, *G. lowii* Merrill & Chun from Hainan and *G. laoticus* (Finet & Gagnep.) Tien Ban from Laos.

*G. philippinensis* differs from *G. australis* in having appressed pubescent carpels and around 17 pairs of secondary leaf veins while *G. lancifolius* differs in having outer petals 7–8 cm long and 25–30 pairs of secondary leaf veins. *G. lowii* and *G. laoticus* both differ from *G. australis* in having  $\pm$  fusiform stigmas.

Subsection *Infundibuliformes* Tien Ban contains several species with funnel-shaped stigmas similar to those seen in *G. australis* but these species have only 1 or 2 ovules per ovary. They occur in Thailand, Indo-China and Malaysia. Presumably there is a gradation between fusiform-cylindric and funnel-shaped stigmas which led Nguyen Tien Ban to base the subsections on ovule number rather than stigma shape.

#### Acknowledgements

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## NEW COMBINATIONS IN AUSTRALIAN ANNONACEAE

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## Summary

The following new combinations are made. *Desmos goezeanus* (F. Muell.) Jessup; *Desmos wardianus* (Bailey) Jessup; *Miliusa brahei* (F. Muell.) Jessup; *Polyalthia australis* (Benth.) Jessup; *Pseuduvaria froggattii* (F. Muell.) Jessup. *Unona queenslandica* Domin is a synonym of *Desmos goezeanus* and *Polyalthia holtzeana* F. Muell. is a synonym of *Polyalthia australis*.

Recent studies in Australian Annonaceae have indicated the need for correct placement of five taxa. Descriptions and other details on each species will be published in forthcoming papers as each genus is revised. The necessary new combinations follow.

***Desmos goezeanus* (F. Muell.) Jessup, comb. nov.**

*Uvaria goezeana* F. Muell., *Fragm.* 7: 125 (1871). **Type:** Rockingham Bay, Qld, 1870, *J. Dallachy* (MEL, holo; BRI, K, iso).

*Unona queenslandica* Domin, *Biblioth. Bot.* 89: 670 (1925), **synon. nov.** **Type:** Lake Eacham, 1 Feb 1910, *K. Domin* (PR, holo).

***Desmos wardianus* (Bailey) Jessup, comb. nov.**

*Unona wardiana* Bailey, *Qd Fl.* 6: 1996 (1902). **Type:** Mapoon, Qld, 22 May 1901, *J.F. Bailey* (BRI, holo).

***Miliusa brahei* (F. Muell.) Jessup, comb. nov.**

*Saccopetalum brahei* F. Muell., *Fragm.* 8: 159 (1874). **Type:** near Port Denison, Qld, *E. Fitzalan* (MEL, holo; BRI, K, iso).

***Polyalthia australis* (Benth.) Jessup, comb. nov.**

*Popowia australis* Benth., *Fl. Austral.* 1: 52 (1863). **Type:** Barrow Bay, Port Essington, N.T., May 1840, *J. Armstrong* 623 (K, holo).

*Polyalthia holtzeana* F. Muell., *The Southern Sci. Rec.* 2: 230 (1882), **synon. nov.** **Type:** Near Port Darwin, *M. Holtze* 181 (MEL, holo).

***Pseuduvaria froggattii* (F. Muell.) Jessup, comb. nov.**

*Mitrephora froggattii* F. Muell., *Australasian Journ. Pharm.* 2: 3 (1887). **Types:** Mossman River, Qld, in 1886, *W. Sayer* 145 MEL 670807, *W. Sayer* 145 & *W. Froggatt* MEL 670808, *W. Sayer* MEL 670809 (MEL, syn).

## Acknowledgements

I extend my thanks to the Directors of K and MEL for the loan of type material.

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## NEW SPECIES OF *RHODAMNIA* JACK (MYRTACEAE) FROM AUSTRALIA

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### Summary

*Rhodamnia dumicola*, *R. whiteana* and *R. glabrescens* are described and a key to the Australian species of *Rhodamnia* is provided. An emended description of *R. costata* is given.

The genus *Rhodamnia* Jack has recently been revised by Scott (1979) who described eight new species including *R. costata* A.J. Scott from eastern Queensland. On examining the type collection (Hyland 7940) of *R. costata* and material at BRI placed by Scott under this name, it was obvious that there was more than one taxon within his concept of this species. We have recognised three species within Scott's broad interpretation of *R. costata*. In fact, *R. costata* as circumscribed by us does not have costate fruit, the basis for Scott's specific epithet.

We have maintained *Rhodamnia spongiosa* (Bailey) Domin as being distinct from *R. glauca* Bl. New Guinea material held at BRI and cited by Scott (*loc. cit.*) as *R. glauca* includes two taxa. Until we examine the type of *R. glauca* and other New Guinea material of this species, we are hesitant to accept that *R. spongiosa* is conspecific with *R. glauca*.

*Rhodamnia propinqua* C. White was treated by Scott (*loc. cit.*) as a variety of *R. blairiana* F. Muell. Although these two taxa have superficially similar leaves they are quite distinct species. *R. blairiana* differs from *R. propinqua* by its ovate-lanceolate leaves which are 3-veined above the base, stouter and shorter pedicels, and coarser tomentum on the flowers and inflorescences.

Material of a further new species was brought to our attention by Mr W.J. McDonald in 1980. Flowering and fruiting material of this species was recently obtained through the generosity of Mr N. Gibson enabling it to be formally described.

The leaf descriptions are based on dried material, although *R. glabrescens*, *R. whiteana* and *R. dumicola* were studied in the field. The floral and fruit descriptions are based on material preserved in spirit or reconstituted material. Inflorescence terminology follows that of Briggs and Johnson (1979), leaf terminology follows that of Hickey (1973) and ecological terminology follows that of Webb (1978).

### *Rhodamnia dumicola* Guymer & Jessup, sp. nov.

Differt a *R. costata* A.J. Scott baccis 7-9-lobis depressio globularibus, inflorescentiis post foliis, habitatione et habitu. **Typus:** ca 1 km SE of Pine Mtn, rd to Worlds End Pocket, N of Ipswich, 9 Dec 1981, *Guymer 1654 & Jessup* (holotypus BRI, isotypi BRI, CANB, CBG, DNA, K, L, MEL, MO, NE, NSW, SING).

Small trees or shrubs 3-6 m; bark grey, rough, slightly flaky. Branchlets terete with pale grey bark, puberulent when young, glabrescent. Lamina ovate or slightly obovate, glabrous above, hoary below, (30-) 35-60 mm long, (18-) 22-42 mm wide; apex acuminate, obtuse, rounded or retuse; base attenuate, decurrent; oil glands dense, 1-5 per areole; primary veins 3, suprabasal perfect acrodromous, laterals 0.5-3 mm from margin (up to 5 mm on juvenile leaves); secondary veins 11-20 pairs; tertiary venation distinct and slightly raised above, obscure below except on young leaves; midrib sunken above, raised below; petiole glabrous or puberulent, channelled above, 5-10 mm long. Inflorescences ramal and lower axillary, fasciculate, monads or triads, 6-10 mm long; axes puberulent; peduncles 2-4 mm long; pedicels 1-5 mm long; metaxophylls and prophylls ovate, puberulent, persistent or sub-persistent, 0.4-0.8 mm long. Flowers 4-merous; perigynium sparsely puberulent, 1.5-2 mm long and 1.9-2.1 mm diam. at anthesis. Calyx lobes semi-elliptic, obtuse, sparsely puberulent, ciliate, 1-1.3 mm long, 1.5-1.8 mm wide.

Petals white, ovate, concave, glabrous except ciliate margins, 3–3.5 mm long, 2.8–3 mm wide. Stamens *ca* 90; filaments white, 2.5–3 mm long, *ca* 0.1 mm diam. Ovary with 2 placentas; ovules 26–28. Style glabrous, white, 4.5–4.8 mm long, *ca* 0.4 mm diam. Berry depressed-globular in outline, 7–9-lobed, initially yellow ripening to orange-red, finally dark purple or black, (8.5–) 10–12 mm diam., 6–7 mm long. Seeds 1–8 (–11), angular, reniform, (2–) 3–4 mm long. Fig. 1A–D.

**Flowering period:** November to January.

**Fruiting period:** April to May.

**Distribution:** The species is endemic in south-eastern Queensland from Dawes Range State Forest (latitude 24°30'S) to Bahr's Scrub, S of Beenleigh (latitude 27°48').

Queensland. PORT CURTIS DISTRICT: State Forest 67, Bulburin, *ca* 3 km S of Bulburin Forestry Station, Jul 1978, McDonald 2408 & Stanton (BRI), vicinity of Forest Station, Apr 1980, McDonald 3242, Fisher & Ryan (BRI). WIDE BAY DISTRICT: Splitter's Ck, *ca* 6 km W of Bundaberg on Gin Gin rd, Oct 1984, Jessup 590 (BRI); Fraser Island, May 1921, White (BRI); Pialba, Oct 1921, White (BRI); Bellevue Scrub, Dundowran, Jul 1928, Tryon (BRI); 0.5 km W of Grassy Mtn, *ca* 5 km SSW of Bauple, Dec 1982, Guymer 1836 & Dillewaard (BRI); Theebine, Nov 1921, White (BRI); Kin Kin (W of "Lower Pine"), Dec 1919, Francis (BRI); Imbil, Dec 1943, Clemens (BRI). BURNETT DISTRICT: Valley & Duck Logging areas, State Forest 289, Neumgna, *ca* 16 km W of Yarraman, Apr 1978, Jessup 104 & McDonald (BRI). MORETON DISTRICT: Kilcoy, without date, England (BRI); near Crow's Nest, Feb 1944, Clemens (BRI); Opossum Logging area, State Forest 283 Colinton, Apr 1978, Jessup 90 & McDonald (BRI); Splyard Ck, Wivenhoe Dam, Dec 1983, Bird (BRI); Ward's Scrub, W of Samford, near headwaters of South Pine R., Dec 1983, Jessup 574 & Guymer (BRI), Jessup 573 & Guymer (BRI, L); Betts Rd, Samford, Nov 1984, Guymer 1913 (BRI, NSW, K, L, QRS, CBG, DNA); Worlds End Pocket, Pine Mtn rd, N of Ipswich, Dec 1981, Bird (BRI, NSW, MEL, CBG, CANB, L, K); *ca* 1 km SE of Pine Mt, rd to Worlds End Pocket, N of Ipswich, Dec 1981, Guymer 1653 & Jessup (BRI, CANB, NE, NSW, MEL), Guymer 1654 & Jessup (BRI, CANB, DNA, K, L, MEL, MO, NE, SING), Guymer 1655 & Jessup (BRI), Feb 1982, Guymer 1678 & Jessup (BRI, CANB, K, MEL, NE); Pine Mtn, N of Ipswich, May 1978, Williams 78059 (BRI), June 1978, Williams 78098 (BRI); Bahr's Scrub, S of Beenleigh, Jun 1983, Guymer 1859 & Jessup (BRI).

**Habitat:** *R. dumicola* occurs in notophyll or microphyll vine thickets or low vine forests, often in association with *Araucaria cunninghamii*, from near sea-level to 400 m altitude.

**Affinities:** *R. dumicola* has affinities with *R. costata* and *R. whiteana* but differs in its 7–9-lobed berry, its ramal inflorescences and its smaller flowers. The species occurs in lowland rainforest communities with a mean annual rainfall (M.A.R.) of 900–1200 mm whereas both *R. costata* and *R. whiteana* occur in montane rainforests (750–1200 m) with a M.A.R. in excess of 1500 mm.

The specimens of Clemens from Imbil and Mt Bauple cited by Scott (1979) under *R. costata* are *R. dumicola*. Scott's description of the fruit of *R. costata* was based on the Clemens specimen of *R. dumicola* from Imbil.

This is the species referred to by Stanley & Ross (1986) as *Rhodamnia* sp. 1.

**Etymology:** The specific epithet is derived from *dumo* (thicket) and *cola* (dweller) referring to the species' habitat.

***Rhodamnia whiteana* Guymer & Jessup, sp. nov.**

Differt a *R. costata* A.J.Scott foliis lanceolatis, inflorescentiis majoribus floribus majoribus et baccis majoribus. **Typus:** Mt Cordeaux, just below summit, Moreton District, Queensland, 23 Dec 1981, Guymer 1658 & Jessup (holotypus BRI, isotypi BRI, CANB, CBG, K, L, MEL, MO, NE, NSW, QRS).

Trees 6–18 m; bark dark brown to black, finely longitudinally fissured. Branchlets terete with brown and grey striped bark, puberulent when young, glabrescent. Lamina elliptic, lanceolate or ovate-lanceolate, rarely ovate, glabrous above, hoary below, (4–) 5–9.5 cm long, (1.2–) 1.5–3 cm wide; apex acuminate or acute; base attenuate, decurrent; oil glands dense, 1–5 per areole; primary veins 3, suprabasal perfect acrodromous, laterals 1–3 mm from margin; secondary veins 13–17 pairs; tertiary venation obscure and flush above, distinct and flush below; petiole channelled above, 4–7.5 mm long. Inflorescences axillary, 1 or 2 per axil, triads or metabotryoids, 3–9-flowered, 15–30 mm long; axes puberulent; peduncles 5–9 mm long; pedicels 2–6 mm long; pherophylls and metaxyphylls ovate to narrowly triangular, concave, puberulent, caducous or persistent, 0.8–3.5 mm long, 0.5–1 mm wide. Flowers 4-merous; perigynium hoary, 3–3.5 mm long and 2.8–3.1 mm diam. at anthesis; calyx lobes semi-elliptic, obtuse, hoary, ciliate, persistent, 2.5–3 mm long, 2.3–2.8 mm wide. Petals white, reflexed, obovate, concave, ciliate, sparsely puberulent

outside, 6.5–7.5 mm long, 4–5.5 mm wide. Stamens 100–110; filaments white, 4–6 mm long, *ca* 0.1 mm diam. Ovary with 2 placentas; ovules 76–80. Style puberulent, 7–8 mm long, 0.25–0.5 mm diam. Berry globular, initially yellow, ripening to red, finally dark purple to black, crowned by hoary calyx lobes, 12–13 mm long, 10.5–13 mm diam. Seeds 6–10 (–18) [1–7 viable], angular, reniform, fawn, 3.5–5 mm long. Germination phanerocotylar. **Fig. 1E–G.**

**Flowering period:** December to January.

**Fruiting period:** February to May.

**Distribution:** The species is restricted to the Great Dividing Range from Mt Mistake in south-eastern Queensland to Mebbin Rock in north-eastern New South Wales between 750 and 1200 m altitude.

**Queensland.** MORETON DISTRICT: Mt Mistake, Jun 1887, *Bailey* [BRI 292776] (BRI), without date, *Shirley* [BRI 292775] (BRI); Mistake Mtns, May 1948, *Smith & White* 3600 (BRI), Oct 1920, *White* [BRI 292774] (BRI), Mt Cordeaux, May 1961, *Smith* 11307 (BRI), 15 Nov 1969, *Smith* [BRI 309209] (BRI); Mt Cordeaux, just below summit, Dec 1981, *Guymer* 1658 & *Jessup* (BRI, P, DNA), *Guymer* 1659 & *Jessup* (BRI, CANB, CGB, K, L, MEL, MO, NE, NSW, QRS), *Guymer* 1660 & *Jessup* (BRI, NOU, A, SING, BO), *Guymer* 1660a & *Jessup* (BRI), Mar 1982, *Guymer* 1680 & *Jessup* (BRI, CANB, DNA, K, MO, NSW). DARLING DOWNS DISTRICT: Mts near Emu Vale, Nov 1922, *Francis* [BRI 292773] (BRI); Forest Reserve 400, *ca* 22 mls [38 km] SE of Warwick, Apr 1962, *Smith* 11478a (BRI). Without location, without date, *Simmonds* [BRI 11494] (BRI). **New South Wales.** NORTH COAST: Mebbin Rock, Jul 1981, *Floyd* (BRI).

**Habitat:** *R. whiteana* occurs in montane complex notophyll vine forest on basalt.

**Affinities:** *R. whiteana* is most closely related to *R. costata* and differs by its lanceolate leaves with primary lateral veins 1–3 mm from the margin, larger inflorescences and flowers, hoary perigynium and calyx lobes and its larger berries.

The specimens of Constable [NSW 24351] (NSW) and Simmonds [BRI 11495] (BRI) cited by Scott (1979) under *R. costata* are referable to *R. whiteana*.

This is the species referred to by Stanley & Ross (1986) as *Rhodamnia* sp. 2.

**Etymology:** The specific epithet commemorates Cyril Tenison White (1890–1950), Queensland Government Botanist (1917–1950), who made significant contributions to the taxonomy of Queensland plants. He described two new species of *Rhodamnia* in his treatment of this genus (White 1937).

***Rhodamnia costata*** A.J. Scott, Kew Bulletin 33: 453 (1979). **Type:** Bridle logging area, State Forest Reserve 607, Jan 1975, *Hyland* 7940 (holotype, not seen, isotype BRI, QRS).

Trees 16–25 m; bark fissured and flaky. Branchlets terete with brown or grey bark, puberulent when young, glabrescent. Lamina ovate or elliptic, glabrous above, hoary below, 4–7 cm long, 2–3.5 cm wide; apex slightly acuminate, obtuse; base attenuate, decurrent; oil glands dense, 1–4 per areole; primary veins 3, suprabasal perfect acrodermous, sunken above, raised below, laterals 2–4 mm from margin; secondary veins 8–13 pairs; tertiary venation obscure, except on abaxial surfaces of young leaves; petiole channelled above, 4–8 mm long. Inflorescences axillary and ramal, monads or triads, 12–18 mm long; axes puberulent; peduncles up to 8 mm long; pedicels 1–3 mm long; pherophylls and metaxophylls persistent or deciduous, ovate, puberulent, 0.6–1.2 mm long. Flowers 4-merous; perigynium glabrous, 2–3 mm long and 2–2.5 mm diam. at anthesis; calyx lobes semicircular, glabrous except for ciliate margins, 1–1.6 mm long, 1.5–2 mm wide. Petals white and tinged with pink towards base, sparsely puberulent outside, ciliate, obovate, 4–6.5 mm long, 3.5–5 mm wide. Stamens 106–115; filaments white, 3–6 mm long. Ovary with 2 placentas; ovules 62–67. Style puberulent, pink, 5.7–6.2 mm long. Berry globular, glabrous, red, crowned by calyx lobes, 5–7 mm long, 6–8 mm diam. Seeds 3–6, reniform, 3–4 mm long.

**Flowering period:** December to January.

**Fruiting period:** April to May.

**Distribution:** *R. costata* occurs from the Mt Windsor Tableland, to the Clarke Range, NW of Mackay, in north-eastern Queensland between 760 and 1100 m altitude.

**Queensland.** COOK DISTRICT: State Forest Reserve 144, Windsor Tblld, Nov 1971, *Hyland* RFK 2558 (QRS), Oct 1975, *Hyland* RKF 3361 (QRS), Apr 1976, *Hyland* RKF 3410 (BRI, QRS), Jan 1977, *Hyland* 9276 (BRI, QRS), Jul 1978, *Hyland* RKF 3737 (QRS), RKF 3738 (QRS), Oct 1979, *Moriarty* 2690 (QRS), Jun 1976, *Sanderson* 1074 (QRS), Jun 1979, *Sanderson* 1632 (QRS); Bridle logging area, State Forest Reserve 607, Dec 1974, *Hyland* RKF 3141 (QRS), Jan 1975, *Hyland* 7940 (BRI, QRS); State Forest Reserve 194, Sep 1968, *Hyland* RKF 1974 (QRS), May 1979, *Risley* 576 (QRS); Mt Spec, Mar 1933, *White* 8964 (BRI), Apr 1979, *Frith* RF55 (QRS); State Forest Reserve 268, Cloudy logging area, Jul 1968, *Hyland* RKF 1598 (QRS). SOUTH KENNEDY DISTRICT: Cathu State Forest, 8 km SW of Cathu, Nov 1981, *Young* (BRI); Clarke Ra., Cathu, Apr 1983, *Dansie* s.n. (QRS); Eungella Ra., Sep 1938, *White* 12958 (BRI); Dalrymple Hts, ca 37 miles [62 km] W of Mackay, Aug 1965, *Martin* & *Gould* s.n. (BRI); near Crediton Parish, Dalrymple Hts, Oct–Nov 1947, *Clemens* s.n. (BRI).

**Habitat:** The species occurs in montane simple notophyll vine forest on granites.

**Affinities:** The species is most closely related to *R. whiteana* but differs by its ovate leaves with the primary lateral veins 2–4 mm from the margin, smaller inflorescences and flowers, glabrous perigynium and calyx lobes and smaller berries.

***Rhodamnia glabrescens* Guymer & Jessup, sp. nov.**

*R. maidenianae* C. White proxima cujus inflorescentias, folia glabra, habitum et corticem habet. Differt domatiis, venatione foliorum, floribus et innovationibus puberulis. **Typus:** State Forest 67 Bulburin, 23 May 1985, *N. Gibson* 733 (holotypus BRI, isotypus BRI).

Shrubs or small spindly trees 2–4.5 m; bark brown, flaky. Branchlets terete or slightly quadrangular, with brown bark peeling off in strips; shoot apices and buds appressed sericeous. Lamina ovate to ovate-lanceolate, glabrous or with scattered appressed hairs, 6–10.5 cm long, 2–5 cm wide; apex acuminate, acute; base attenuate, decurrent; oil glands sparse and only in vicinity of midrib; domatia present as pockets at junction between primary veins, glabrous; primary veins 3, suprabasal perfect acrodromous, sunken above, raised below; secondary veins 8–12 pairs; tertiary venation distinct and raised above, obscure below except on young leaves; petiole puberulent, glabrescent, channelled above, 3–5 (–6) mm long. Inflorescences axillary, fasciculate, triads or monads, 10–13 mm long; axes puberulent, glabrescent; peduncles up to 3 mm long; pedicels 4–6 mm long; pherophylls and metaxophylls puberulent, lanceolate, persistent or deciduous, 1.5–2 mm long. Flowers 4-merous; perigynium sparsely appressed-puberulent, 2–2.5 mm long and 1.9–2.2 mm diam. at anthesis; calyx lobes ovate, ciliate, sparsely appressed-puberulent, glabrescent, 3–3.5 mm long, 2.2–2.8 mm wide. Petals white, obovate to broadly obovate, ciliate, 5.5–6 mm long, 4–5 mm wide. Stamens 78–86; filaments mauve, 3–3.5 mm long, ca 0.1 mm diam. Ovary with 2 placentas; ovules 32–35. Style glabrous, 4.5–5.5 mm long. Berry globular, smooth, dull red, 4–7 mm diam., 4–9 mm long, crowned by erect calyx lobes ca 3 mm long. Seeds 2 or 3, reniform, flattened, (3–) 4–4.5 mm long. **Fig. 1H & I.**

**Flowering period:** May.

**Fruiting period:** July to August.

**Distribution:** *R. glabrescens* is only known from Dawes Range State Forest (previously State Forest 67, Bulburin) in the upper catchment of Granite Creek and Boyne River at altitudes of 200 to 500 m.

**Queensland.** PORT CURTIS DISTRICT: Granite Ck, 0.5–1 km NW of Boobook Ck junction, State Forest 67, Bulburin, Dec 1982, *Guymer* 1820 & *Dillewaard* (BRI, NSW), *Guymer* 1817 & *Dillewaard* (BRI); Boyne Logging area, Bulburin State Forest, Apr 1980, *McDonald* 3160, *Fisher* & *Ryan* (BRI); State Forest 67, Bulburin, ca 24 km W of Lowmead, Jul 1978, *McDonald* 2368 (BRI, CANB), May 1985, *Gibson* 733 (BRI), Aug 1985, *Gibson* s.n. (BRI).

**Habitat:** The species occurs in complex notophyll vine forest.

**Affinities:** *R. glabrescens* is perhaps most closely related to *R. maideniana* which also has glabrous leaves, similar inflorescences, habit and bark. Nevertheless, it differs from this species by its sericeous flowers and shoot apices, leaf venation and sparse oil glands in the leaves.

**Etymology:** Named from the Latin *glabrescens* in reference to the almost glabrous inflorescences and leaves.



**Fig. 1.** *Rhodamnia dumicola*: A. flower and bud (Guymer 1654 & Jessup)  $\times 3$ . B. flowering branchlet (Guymer 1654 & Jessup)  $\times 1$ . C. fruiting branchlet (Guymer 1678 & Jessup)  $\times 1$ . D. mature fruits (Guymer 1678 & Jessup)  $\times 1$ . *R. whiteana*: E. flowering branchlet (Guymer 1658 & Jessup)  $\times 3$ . F. detailed view of a flower (Guymer 1680 & Jessup)  $\times 1$ . G. fruiting branchlet (Guymer 1680 & Jessup)  $\times 1$ . *R. glabrescens*: H. fruiting branchlet (Gibson s.n.)  $\times 1$ . I. flowering branchlet (Gibson 733)  $\times 1$ .

Key to Australian Species of *Rhodamnia*

1. Leaves glabrous or with scattered hairs along the veins below . . . . . 2  
     Leaves with a distinct abaxial tomentum . . . . . 4
2. Inflorescences ramal; flowers and fruits in sessile fascicles.  
     NE Qld . . . . . **R. sessiliflora** Benth.  
     Inflorescences axillary; flowers and fruits pedicellate . . . . . 3
3. Primary lateral veins (3-) 4-6 mm from margin; oil glands sparse, in  
     vicinity of midrib. Subcoastal central Qld . . . . . **R. glabrescens**  
     Primary lateral veins 1-3(-4) mm from margin; oil glands dense. SE Qld  
     & NE NSW . . . . . **R. maideniana**
4. Leaves, inflorescence axes and flowers sericeous . . . . . 5  
     Leaves, inflorescence axes and flowers pubescent or hoary . . . . . 6
5. Primary lateral veins 3-12 mm from margin; leaves ovate-acuminate.  
     Coastal SE Qld . . . . . **R. acuminata** C.White  
     Primary lateral veins 1-3 mm from margin; leaves ovate or elliptic.  
     NT & N Qld . . . . . **R. australis** A.J.Scott
6. Abaxial leaf surface hoary . . . . . 7  
     Abaxial leaf surface pubescent or ferruginous villous . . . . . 11
7. Petals glabrous or sparsely puberulent outside . . . . . 8  
     Petals white villous outside . . . . . 10
8. Inflorescences ramal or lower axillary. Berries depressed globular, 7-9-  
     lobed. SE Qld . . . . . **R. dumicola**  
     Inflorescences axillary. Berries globular, not lobed . . . . . 9
9. Inflorescences 15-30 mm long, metrabortryoids or triads; calyx lobes  
     hoary. Leaves lanceolate (length:breadth 2.3-4.1:1); primary lateral  
     veins 1-3 mm from margin. SE Qld & NE NSW . . . . . **R. whiteana**  
     Inflorescences 12-18 mm long, monads or triads; calyx lobes glabrous.  
     Leaves ovate or ovate-lanceolate (length:breadth 1.7-2.4:1); primary  
     lateral veins 2-4 mm from margin. NE Qld . . . . . **R. costata**
10. Lamina 3-veined from the base; primary lateral veins 4-6 mm from  
     margin. Petals 3-4 mm long. SE Qld & NE NSW . . . . . **R. argentea** Benth.  
     Lamina 3-veined above the base; lateral veins 5-13 mm from margin.  
     Petals 5-7 mm long. NE Qld . . . . . **R. spongiosa**
11. Flowers and abaxial leaf surfaces ferruginous villous with crinkled hairs;  
     placentas 3 (or 2). NE Qld . . . . . **R. blairiana** F. Muell.  
     Flowers glabrous or sparsely pubescent; abaxial leaf surfaces white or  
     grey pubescent; placentas 2 . . . . . 12
12. Inflorescences triads or botryoids; leaf pubescence of erect hairs; leaves  
     7-9 cm long, 3-4 cm wide. SE Qld & E NSW . . . . . **R. rubescens** (Benth.)Miq.  
     Inflorescences monads; leaf pubescence of appressed and erect hairs;  
     leaves 3-6 cm long, 1.8-3.2 cm wide. E central Qld . . . . . **R. sp. A**



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**ACACIA MACONOCHIEANA (MIMOSACEAE),  
A NEW SPECIES FROM SEMI-ARID AUSTRALIA**

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**Summary**

*Acacia maconochieana* is described as new. It has a restricted range in Western Australia and the Northern Territory. It is compared with *A. tephрина* Pedley.

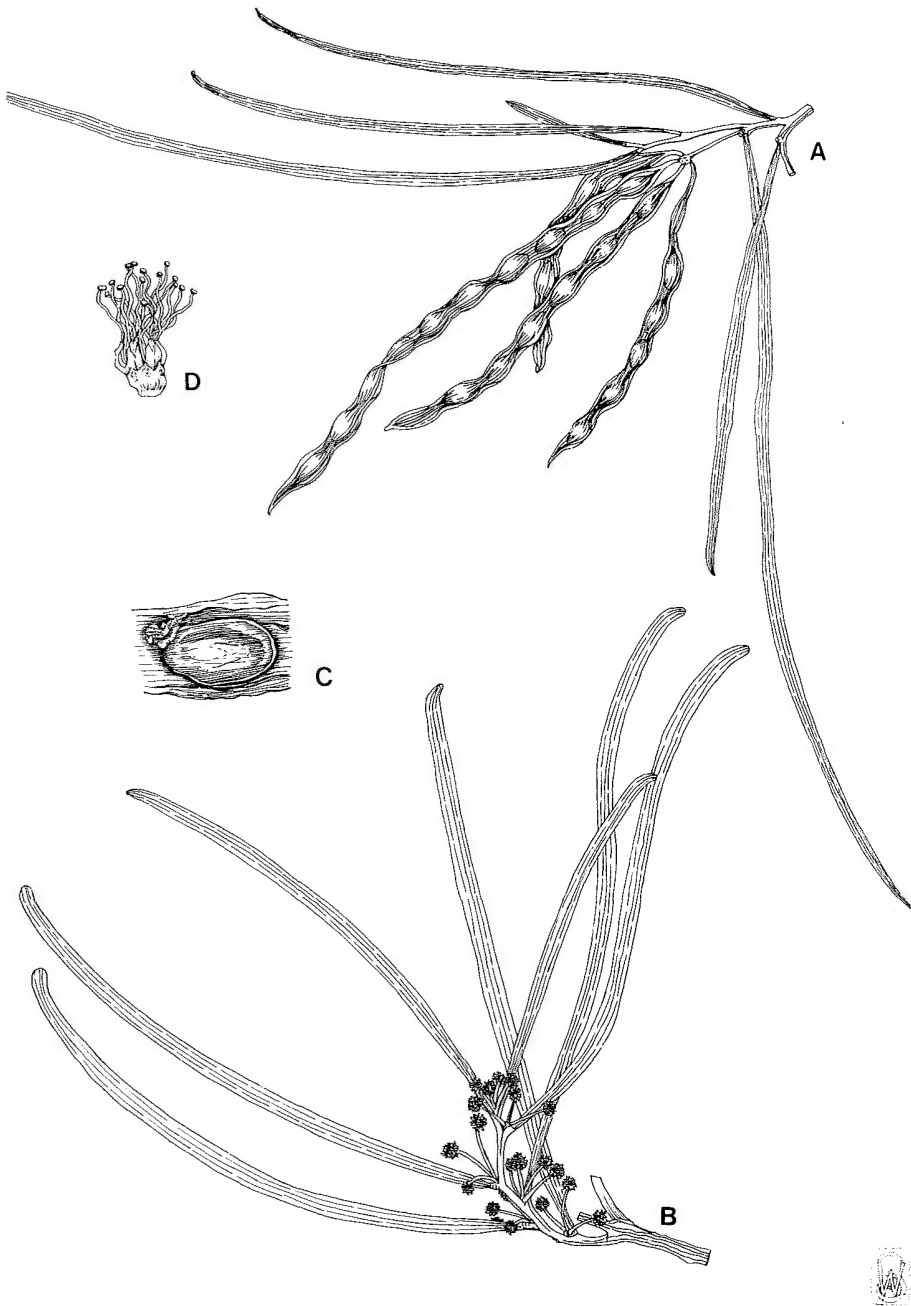
**Acacia maconochieana** Pedley, *sp. nov.* affinis *A. tephрина* Pedley ramis inflorescentium paucioribus, calyce longiore corollae dimidio breviori vix lobato saepe pilis aureis ornato, leguminibus longioribus differt. **Typus:** *J.R. Maconochie* 1749 (BRI, holotypus; specimina distributa ad AD, B, CANB, DNA, K, NSW, NT, PERTH, sed non visa).

Arbor usque 10 m alta cortice cinera sulcato longitudinaliter (fide *Thomson*); ramuli tenues angulares indumento pilorum brevium appressorum in angulis flavidis evanescenti. Phyllodia recta vel leviter falcata, plerumque obtusa irregulariter interdum acuta, 8–15 (–17) cm longa, 2–5.5 mm lata, 20–40 (–80) plo longiora quam latiora, nervis multis tenuis longitudinalibus (usque 30 in phyllodiis latis), dense appresse pubescentia, pilis ca 0.1 mm longis in phyllodiis veteribus in areas intercostates limitatis interdum phyllodiorum basin versus leviter patentibus; glans basalis; pulvinus 2–3 mm longus. Capitula 20–25 florum pilis aureis inter flores in racemos dense pubescentes axillares 2–4 ramosos disposita ex axe 2–3 mm longa, ramis 4.5–8 mm longis constantes. Flores 5-meri; calyx membranaceus 0.6–0.9 mm longus plerumque pubescens in parte supra lobis obtusis perbrevis praeditus; corolla 1.5–1.7 mm longa, calyce ca 2 plo longior, lobis in parte infera conjunctis; stamina ca 3 mm longa; ovarium dense pubescens. Legumina recta linearia plana leviter contracta inter semina et convexa supra ea, pubescentia dense appresse, usque 12-sperma et 13 cm longa, 5 mm lata; semina longitudinalia 5.5–6 mm longa, ca 2.5 mm lata; pleurogramma tenuis areolam angustam apertam formans; funiculus 2 parvis plicis arillum basilem faciens.

A tree to 10 m with a single trunk to ca 5 m, up to 30 cm d.b.h.; bark grey, longitudinally furrowed (fide *Thomson*); branchlets slender, angular with a dense indumentum of short appressed hairs wearing off on the yellowish ribs. Phyllodes straight or slightly falcate, linear, usually irregularly obtuse, occasionally acute, 8–15 (–17) cm long, 2–5.5 mm wide, 20–40 (–80) times as long as wide, many fine parallel longitudinal nerves (up to 30 on wide phyllodes), densely appressed pubescent with hairs ca 0.1 mm long, hairs on old phyllodes confined to intercostal areas and hairs at base of phyllodes spreading to some extent; gland basal; pulvinus 2–3 mm long. Heads of 20–25 flowers with golden hairs among the flowers, in densely pubescent axillary 2–4-branched racemes, the axis 2–3 mm long, branches 4.5–8 mm long. Flowers 5-merous; calyx membranous, 0.6–0.9 mm long, usually golden pubescent in upper part, with extremely short obtuse lobes; corolla 1.5–1.7 mm long, the lobes united in the lower third; stamens ca 3 mm long; ovary densely pubescent. Pod straight, linear, flat, slightly contracted between seeds and raised over them, densely appressed pubescent, up to 12-seeded and 13 cm long, 5 mm wide. Seeds longitudinal, 5.5–6 mm long, ca 2.5 mm wide; pleurogram fine forming narrow open areole ca 3 times as long as wide; funicle with two folds forming basal aril. **Fig. 1.**

**Western Australia.** ± 2 km NW of Lens Bore, Lake Gregory, 20°14'S, 127°29'E, Apr 1979, *George* 15415 (BRI; PERTH *n.v.*); SW edge of Bulbi Plain, 44 km SW of Lake Gregory (Mulan) Settlement, 20°17'S, 127°19'E, Oct 1984, *Thomson* LXT 95 (BRI; FRI *n.v.*); 21 km SE of Bungabiddy Well, Lake Gregory, 20°16'S 127°28'E, Oct 1984, *Thomson* LAJT 36 (BRI; FRI *n.v.*); Werriaddo Ck, 20°18'S, 127°25'E, Jun 1980, *Burbidge* 157 (BRI; PERTH *n.v.*); E of Lewis Ra. (approx. 20°10'S, 28°40'E), Jun 1968, *Beard* 5571 (PERTH). **Northern Territory.** 117 km W of Hookers Creek, 18°12'S, 129°44'E, Jul 1973, *Maconochie* 1749 (TYPE: BRI, holo; AD, B, CANB, DNA, K, NSW, NT, PERTH, *n.v.*); Sanctuary Swamp, 20°04'S, 129°33'E, Jul 1980, *Maconochie* 2454 (BRI; AD, B, CANB, DNA, HO, K, MEL, MO, NSW, NT, NY, PERTH, *n.v.*).

**Ecology:** The species is restricted to the northern part of the Mueller Botanical District (Beard, 1980) of Western Australia and adjacent parts of the Northern Territory where



**Fig. 1.** *Acacia maconochieana*: A. fruiting branch  $\times \frac{2}{3}$ . B. flowering branch  $\times \frac{2}{3}$ . c. seed  $\times \frac{8}{3}$ . D. flower  $\times 5$ .

it is reported to occur on fine-loam and clay soils some of which are periodically waterlogged and some suspected of being saline. It is particularly common around Lake Gregory. It forms thickets when young or low open forest and woodland with little understory when mature.

*Acacia maconochieana* has potential as a fuel-wood species for semi-arid tropical and subtropical regions of the world. In situations receiving extra run-on water it grows to a sizeable tree on fine-textured soils. The environment is harsh with the mean maximum annual temperature exceeding 30°C., an unreliable rainfall averaging 350 mm per annum and annual average evaporation about 2 800 mm.

The species has been discussed by Pedley (1981). Maslin (1981) treated it and possibly two other taxa (one from 'Indiana' Station, Northern Territory, the other from Richmond, Queensland) as *Acacia* sp. aff. *A. cambagei* R.T. Baker. Members of the Microneuræ group of *Acacia*\* are often difficult to identify from herbarium material, though they usually have distinctive facies in the field. The attributes that distinguish *A. maconochieana* from *A. tephрина* (fewer heads in the axillary racemes, slightly bigger calyx half as long as the corolla, longer pods) may seem slight but are consonant with attributes of the sort that distinguish other species-pairs of the group; for example, *A. tephрина* from *A. cana* Maiden, and *A. microsperma* Pedley from *A. omalophylla* Cunn. ex Benth. Many species of the group are virtually confined to clay soils. Some of them, for example *A. cambagei* and *A. harpophylla* F.Muell. ex Benth., are widely distributed but others, especially *A. ammophila* Pedley, *A. maranoensis* Pedley and *A. microcephala* Pedley, have narrow ranges.

**Etymology:** The species is named to commemorate John Maconochie (1941–84) a knowledgeable botanist and a good companion.

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\*See Pedley (1978:84) for use of term group.

## STUDIES IN AUSTRALIAN GRASSES: 2\*

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## Summary

A new species, *Arthrargrostis aristispicula* is described. New combinations are *Australopyrum velutinum* based on *Agropyron velutinum* Nees, *Austrofestuca pubinervis* based on *Festuca pubinervis* Vickery, *Critesion murinum* subsp. *glaucom* based on *Hordeum glaucum* Steudel and *Elymus scabrus* var. *plurinervis* based on *Agropyron scabrum* var. *plurinerve* Vickery. *Australopyrum retrofractum* (Vickery) A. Löve and *Agropyron retrofractum* Vickery are synonyms of *Australopyrum pectinatum* (Labill.) A. Löve.

Further investigation of the recently erected genera *Arthrargrostis* Lazarides (Lazarides 1985) and *Austrofestuca* Alexeev (Alexeev 1976) and a scrutiny of the recent taxonomic treatment of the tribe *Triticeae* (Löve 1984) necessitates some nomenclatural changes.

*ARTHRARGROSTIS* Lazarides

In my opinion the genus *Arthrargrostis* as defined by Lazarides in 1985 includes two distinct taxa which should be recognized at species rank. They differ by the degree to which the apices of the upper glume and the lower lemma are extended.

*Arthrargrostis aristispicula* B. Simon, sp. nov. affinis *A. deschampsii* (Domin) Lazarides sed gluma supra et lemmate inferno ad 2 mm saltem differt. **Typus:** Queensland. Cook District: 4 km from Almaden on Petford road, 17° 22'S, 144° 42'E, 10 Mar 1980, Simon 3598 & Clarkson (holotypus BRI; isotypus CANB).

In *A. deschampsii* the apices are drawn out into a cusp to 0.3 mm long whereas in *A. aristispicula* the apices extend to an arista or short awn at least 2 mm long. The description by Lazarides (1985) is adequate for both species except for the following modifications.

**A. deschampsii.** Lower glume ca 2.5 mm long, broadly ovate, obtuse to subacute. Upper glume 3–4 mm long with an apical cusp ca 0.3 mm long, with 9–11 ribbed nerves. Lower lemma 4.5–5 mm long with an apical cusp ca 0.3 mm long, narrowly lanceolate. **Figs 1 & 3.**

**Specimens examined** (all BRI). Queensland. COOK DISTRICT: Lazarides 4212. NORTH KENNEDY DISTRICT: Blake 8159, Blake 13343, Blake 14919. For collecting details see Lazarides (1985).

The holotype (Domin 1209 in PR) was not examined by me, but has been matched with Blake 8159 (from the type locality) at Kew by Dr C.E. Hubbard according to notes of S.T. Blake in BRI.

Furthermore the type description of *Panicum deschampsii* (Domin 1915) refers to the upper glume and lower lemma as being subacuminate, placing it within the limits of my emended description.

**A. aristispicula.** Spikelets 5.5–7 × 1–1.5 mm. Lower glume 3–4 mm long, including a mucro ca 0.5 mm long, broadly ovate, obtuse to subacute. Upper glume 5.5–7 mm long, including an awn to 2 mm long, with 9–11 ribbed nerves. Lower lemma 6–7.5 mm long, including an awn to 2 mm long, narrowly lanceolate. **Figs 2 & 4.**

**Specimens examined** (all BRI). Queensland. COOK DISTRICT: Simon 3598 & Clarkson, Blake 13491, Goodall in BRI 028678, Goodall 66. NORTH KENNEDY DISTRICT: Blake 14905, Blake 11704. For collecting details see Lazarides (1985).

**Ecology:** *A. aristispicula* tends to inhabit wetter areas than *A. deschampsii*.

**Etymology:** The specific epithet is derived from the aristate to awned apices of the upper glume and lower lemma.

\* Continued from Austrobaileya 2: 23 (1984)



Fig. 1. Specimen of *Arthrargrostis deschampsoides* (Blake 8159) from the type locality.



**AUSTRALOPYRUM** Å. Löve

When the genus *Australopyrum* was established by Löve in 1984 the two species he accepted in it were *A. pectinatum* and *A. retrofractum* with the latter having two subspecies, subsp. *retrofractum* and subsp. *velutinum*. However, although the author recognized these formal taxa he (Löve, pers. comm.) is of the opinion that the 'three recognized taxa are isolated by geography but strictly autogamous' and he doubts 'that they represent more than geographical races of a single species'. In the light of experimental work this may be shown to be the situation but for the time being the treatment of Willis (1970) and Forbes et al. (1984) seems a preferable course to follow, and to establish names under *Australopyrum* for the taxa recognized by them.

**Australopyrum velutinum** (Nees)B. Simon, **comb. nov.**

*Agropyron velutinum* Nees in W.J. Hooker, J. Bot. 2: 417s (1840). *Australopyrum retrofractum* subsp. *velutinum* (Nees) Å. Löve, Feddes Rep. 95: 443(1984). **Type:** Tasmania, Gunn 770, *n.v.*

**Australopyrum pectinatum** (Labill.)Å. Löve, *loc. cit.*

*Festuca pectinata* Labill., Nov. Holl. Pl. Specim. 1: 21, t.25 (1805).**Type:** ? *Labil-lardiere*, *n.v.*

*Agropyron retrofractum* Vickery, Contr. New South Wales Nat. Herb. 1: 340 (1951), **synon. nov.** *Australopyrum retrofractum* (Vickery) Å. Löve, *loc. cit.*, **synon. nov.** **Type:** Betche NSW 9116, *n.v.*

**AUSTROFESTUCA** (Tzvelev)E. Alexeev

When *Festuca* subgenus *Austrofestuca* Tzvelev was elevated to generic rank by Alexeev in 1976, one new combination *A. littoralis* (Labill.)E. Alexeev was made for *Festuca littoralis* and *F. pubinervis* Vickery was placed in synonymy. Although the species the latter name applied to had also not been recognized as distinct from *F. littoralis* by Gardner (1952) the distinction between the two entities was clearly made by Vickery (1939) and both are currently upheld at NSW (S.W.L. Jacobs pers. comm.). A name is thus required for Vickery's taxon under *Austrofestuca*. Although only one species is presently recognised at PERTH, Dr T.D. McFarlane of that institution (pers. comm.) is also of the opinion that two species should be recognized, probably with one (*A. pubinervis*) in Western Australia and the other (*A. littoralis*) in eastern Australia.

**Austrofestuca pubinervis** (Vickery)B. Simon, **comb. nov.**

*Festuca pubinervis* Vickery, Contr. New South Wales Nat. Herb. 1: 7 (1939). *Festuca triticoides* Steudel, Syn. Pl. Gram. 315 (1854), non Lamarck (1791). **Type:** Drummond 150, *n.v.*

**CRITESION** Raf.

The genus *Critesion* Raf. was resurrected and distinguished from *Hordeum* L. by Löve in 1984 on the basis of a fragile rachis and the sterility of the lateral spikelets; the rachis is tough and the lateral spikelets are perfect or male in *Hordeum*. In addition *Critesion* possesses the haplome H, with a genomic constitution H, HH or HHH as opposed to the haplome I, with a genomic constitution I, in *Hordeum*. The distinction between the three species previously called *Hordeum glaucum* Steudel, *H. murinum* L. and *H. leporinum* Link hinges on rather minor characters (anther colour and relative length of the lateral spikelets) and I think they are best treated taxonomically at the rank of subspecies as was done in Flora Europaea (Humphries 1980), although under the genus *Critesion*. Löve (1984) however preferred to keep *C. glaucum* separate on the basis that it is a diploid in contrast to the *C. murinum* complex (*C. murinum* subsp. *murinum* and *C. murinum* subsp. *leporinum*) which is tetraploid.

**Critesion murinum** (L.) Å. Löve subsp. **glaucum** (Steudel)B. Simon, **comb. nov.**

*Hordeum glaucum* Steudel, Syn. Pl. Glum. 1:352 (1854). *Hordeum murinum* L. subsp. *glaucum* (Steudel)Tzvelev, Nov. Sist. Vyssh. Rast. 8: 67 (1971). *Critesion glaucum* (Steudel) Å. Löve, Feddes Rep. 95: 440 (1984). **Type:** ? Steudel 383, *n.v.*



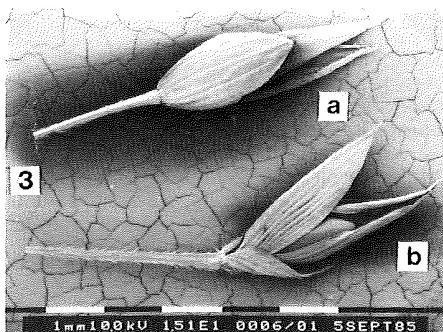


Fig. 3. Spikelets of *Arthrargrostis deschampoides* (Blake 8159) showing a) dorsal and b) ventral views.

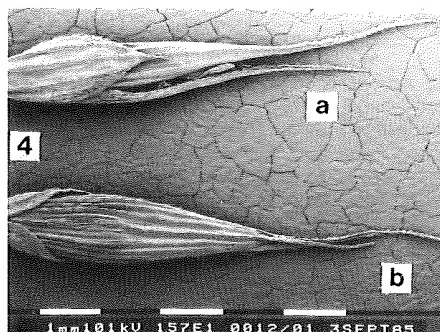


Fig. 4. Spikelets of *Arthrargrostis aristispicula* (type) showing a) dorsal and b) ventral views.

### ELYMUS L.

A new name is required for the well recognized variety (with 6–8-nerved glumes, 10–15 mm long) of the species widely known as *Agropyron scabrum* (R.Br.)P. Beauv., transferred to *Elymus* by Löve in 1984.

***Elymus scabrus* (R.Br.) Á. Löve var. *plurinervis* (Vickery)B. Simon, comb. nov.**

*Agropyron scabrum* (R.Br.) P. Beauv. var. *plurinerve* Vickery, Contr. New South Wales Nat. Herb. 1: 342 (1951), **synon. nov.** **Type:** *Thomas* NSW 8245, *n.v.*

### Acknowledgements

Thanks are extended to Drs. S.W.L. Jacobs (NSW), T.D. MacFarlane (PERTH) and Á. Löve (San Jose, California) in connection with nomenclatural issues discussed in this paper. However, where nomenclatural changes have been made I carry the sole responsibility for these. I am also grateful to my colleagues Mr R.J.F. Henderson for reading the manuscript and suggesting improvements in content and style and Mr H. Dillewaard for photographic work including S.E.M. photomicrographs with the Indoorpill Agricultural Research Laboratories Philips SEM 505 scanning electron microscope.

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## NEW COMBINATION AND SPECIES IN *AUSTROSTEENISIA* GEESINK (FABACEAE-MILLETTIEAE)

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### Summary

A new combination *Austrosteenisia stipularis* (C. White) Jessup is made and a new species *Austrosteenisia glabristyla* Jessup is described.

The genus *Austrosteenisia* was recently described by Geesink (1984) to encompass the two Australian species formerly placed by Polhill (1971) under *Kunstleria*, *K. blackii* (F. Muell.) Polhill and *K. stipularis* (C. White) Polhill. The necessary new combination for the second species follows:

***Austrosteenisia stipularis* (C. White) Jessup, comb. nov.**

*Lonchocarpus stipularis* C. White, Contributions from the Arnold Arboretum of Harvard University 4: 45-46 (1933). *Kunstleria stipularis* (C. White) Polhill, Kew Bulletin 25(2): 265 (1971). **Typus:** Lake Barrine, Atherton Tableland, 8 Nov 1929, S.F. Kajewski 1348 (BRI, holo).

A third species which occurs in south-eastern Queensland and north-eastern New South Wales and known to local botanists for several years (*vide* Williams & Harden 1980) as *Kunstleria* sp. but rarely seen in flower or fruit is here described.

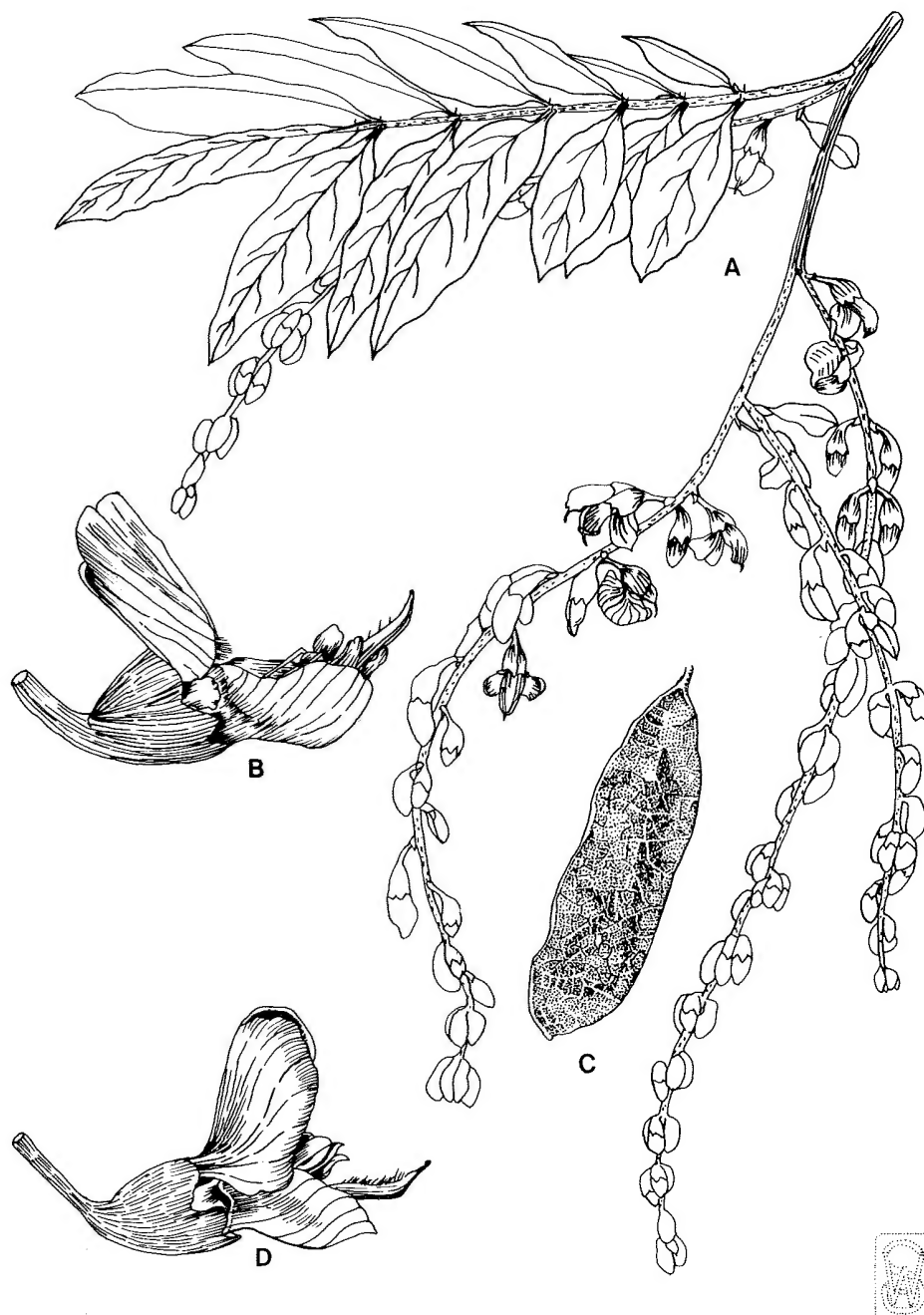
***Austrosteenisia glabristyla* Jessup, sp. nov.** affinis *A. blackii* et *A. stipularis*; ab illa foliolis oblongibus et numerosis fructibus brevioribus differt ab hoc stipellis praesentis, et ab ambobus stylis glabris. **Typus:** Queensland: Picnic Rock Track, Lamington National Park, 10 Jan 1984, L.W. Jessup 581 & A.E. Daly (holotypus BRI; isotypi BRI, CANB, K, L, MEL, MO, NE, NSW).

Tall woody climber. Innovations densely covered with  $\pm$  appressed and erect golden brown silky hairs, glabrescent. Leaves 5-20 cm long, discolorous; stipules ovate, peltate, ciliate, 10-14 mm  $\times$  6-8 mm; stipellae setaceous, 2-5 mm long; leaflets 9-15, opposite or subopposite with a terminal one, oblong-lanceolate to oblong-ob lanceolate, 2.5-10 cm  $\times$  0.7-3.3 cm, increasing in size distally, acuminate with a fragile 1-2 mm long mucro; base acute to rounded; secondary veins mostly 7-9 pairs; higher order venation finely reticulate. Panicles to 20 cm long. Calyx 3-5 mm long, lobes imbricate. Standard depressed ovate, retuse, strongly reflexed, blade 4.5-5 mm  $\times$  6.5-7 mm, claw 2 mm long; wings 2.5 mm long; keel 5.5-6 mm long. Ovary densely pubescent, ovules 13. Style 4-4.5 mm long, glabrous or with a few scattered hairs. Fruit elliptic to oblong, mostly 4-7 cm  $\times$  1.3-1.6 cm, pubescent with short and long hairs; stipe 4-8 mm long. Seeds 1-3, oblong-reniform, the hilum in a submedial sinus; testa brown. **Fig. 1 A-C.**

**Queensland.** MORETON DISTRICT: Picnic Rock Track, Lamington National Park, Jan 1984, Jessup 581 & Daly (BRI, CANB, K, L, MEL, MO, NE, NSW); Jessup 584 (BRI, NE); Currumbin Valley, May 1985, Jones 1807 (BRI, K, L, NSW, QRS); Binna Burra, Lamington National Park, without date, Kouskos [BRI 013246] (BRI); Roberts Plateau, Lamington National Park, Mar 1920, White s.n. (BRI). **New South Wales.** NORTH COAST: Brummies Lookout, approx 2 km SW of Mt Warning, Apr 1979, Jessup 192 (BRI).

*Austrosteenisia glabristyla* occurs mostly in complex notophyll vine forest on the ranges and adjacent footslopes from the McPherson Range, Queensland to the Dorrigo Plateau, New South Wales (Williams 1980).

In describing *Millettia blackii* (*Austrosteenisia blackii*), Mueller (1861) noted 'stipulae nullae' and White, in comparing this species with his *Lonchocarpus stipularis* (*Austrosteenisia stipularis*) also referred to 'the absence of peltate stipules'. Peltate stipules in fact occur in all three species of *Austrosteenisia* but being extremely caducous are to be seen only on specimens bearing newly expanding foliage.



**Fig. 1.** *Austrosteenisia glabristyla*: A. habit (Jessup 581 & Daly)  $\times$  1. B. flower (Jessup 581 & Daly)  $\times$  4. C. legume (Jessup 584)  $\times$  1. *A. blackii*: D. flower (Jessup 22)  $\times$  4.

### Key to species of *Austrosteenisia*

1. Stipellae absent ..... **A. stipularis**  
    Stipellae present ..... 2
  2. Leaflets 7–11, ovate to obovate, length 1–3 times width. Flowers dark  
    maroon; style densely bearded along upper edge ..... **A. blackii**
  - Leaflets 9–15, oblong-lanceolate or oblanceolate, length 3–6 times width.  
    Flowers mauve and white; style glabrous or with a few scattered  
    hairs ..... **A. glabristyla**
- Imperfect material in the Queensland Herbarium suggests there are further taxa  
 of *Austrosteenisia* in north Queensland.

### Acknowledgements

I extend my thanks to Mr L. Pedley for reading the manuscript and correcting the Latin diagnosis. Mr D. Jones kindly collected fruiting specimens at my request. Mr W. Smith produced the line drawings.

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## **LAXMANNIA COMPACTA (ANTHERICACEAE) A NEW SPECIES FROM EASTERN AUSTRALIA**

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### **Summary**

*Laxmannia compacta* Conran & P. Forster, a new species from eastern Australia is described and figured. This species was previously included within *L. gracilis* R.Br.

*Laxmannia* R.Br. is a small endemic Australian genus Bentham placed in his tribe *Johnsonieae* in Liliaceae (Bentham 1878). More recently it has been included in the Anthericaceae (Dahlgren & Clifford 1982; Dahlgren *et al.* 1985). Bentham recognised eight species, six of which occur in Western Australia, with *L. gracilis* R.Br. and *L. sessiliflora* Decne. occurring in eastern Australia. The latter of these two has been recorded in Victoria and south-eastern New South Wales (Willis 1962) while *L. gracilis* has been considered to be distributed from Victoria to northern Queensland.

Studies of the reproductive biology of the Western Australian species have revealed tendencies towards autogamy and quantum speciation with autopolyploidy indicated (Keighery in Peterson & James 1973, Keighery in James & Hopper 1981).

In the course of field collecting in Mundubbera Shire, south-eastern Queensland, material of a *Laxmannia* not easily referable to *L. gracilis* was found. Examination of this material and herbarium accessions identified as *L. gracilis* at BRI, BRIU, and NSW revealed that there were a number of characters by which these collections could be divided into two groups. These characters are quantifiable and analyses performed suggest that two distinct taxa exist in eastern Australia.

### **Materials, Methods and Results**

Specimens identified as *Laxmannia gracilis* at BRI, BRIU, NSW and MEL were examined, and divided into two groups on the basis of perianth, leaf and internode characteristics. 57 specimens of one type, and 32 of the other at BRI, BRIU and NSW (indicated \* in selected specimens and index to collectors) were measured to determine average (n=5) leaf, sepal (outer tepal whorl), petal (inner tepal whorl) and internode lengths, and the data subjected to discriminant function analysis (Fisher 1936; Sokal & Rohlf 1969). The calculations were performed on a PDP-10 computer using the STATPAC program DISCRF. The resulting equation:

$$Di = 7.62116 \times 10^{-2} \times \text{av. leaf length} + 2.89327 \times \text{av. sepal length} + 5.15434 \times \text{av. petal length} \times -1.20239 \times 10^{-1} \times \text{av. internode length}$$

where  $Di$  is the discriminant score for the individual  $i$ , shows that the two major contributing factors to the separation of the group were the average sepal and petal lengths and particularly the petal lengths.

When the  $D$  scores for all the individuals were plotted as a frequency polygon (Fig. 1) the two groups were separated with only a minimal overlap. This statistical separation of the groups, combined with the differences in the degree of anther size and attachment, supports the hypothesis that *L. gracilis* as traditionally circumscribed, consists of two distinct taxa.

### **Taxonomy**

The two taxa here accepted differ in many of the characters considered to be of specific importance in this genus. The perianth characters in particular were used by

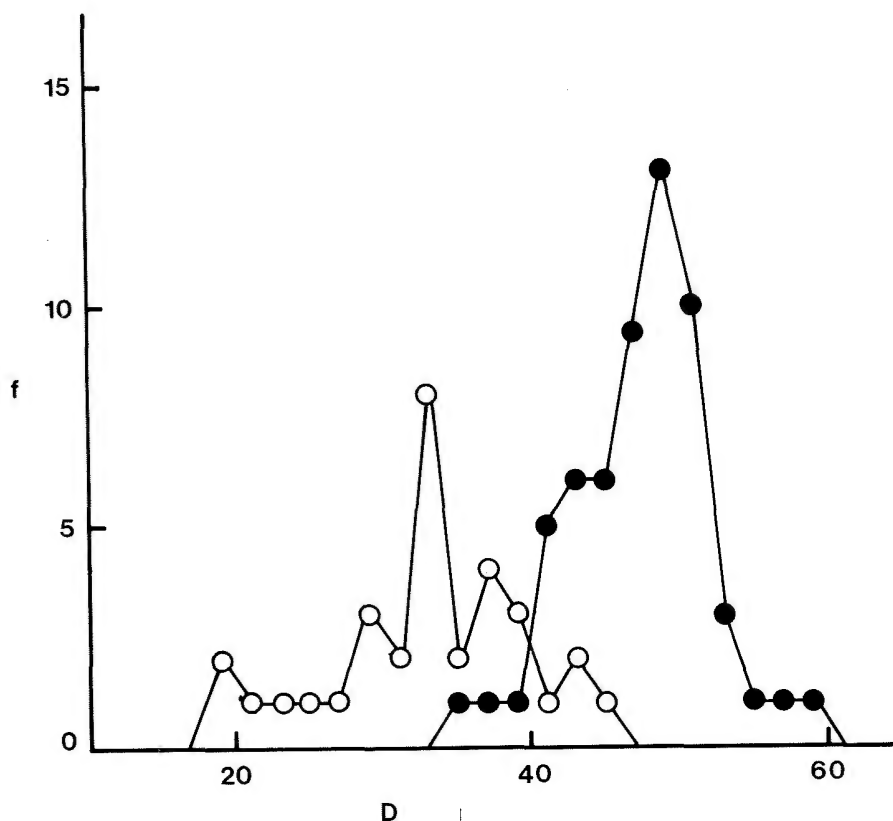


Fig. 1. Frequency polygons of D scores for *Laxmannia compacta* ○ and *L. gracilis* ●

Bentham (1878) to separate species of *Laxmannia*. Accordingly, the two taxa recognised are considered to be of specific rank and are readily distinguishable both in the field and from dried material. Figs 2 & 3.

Throughout much of their known ranges (Fig. 4), these two groups are ecologically and geographically discrete. Material of both species has been collected in close proximity on the Blackdown Tableland, in central Queensland, but there is no evidence of hybridisation. Local allopatry with related species occupying narrow ecologically discrete zones is common in this area.

Isotype material of *L. gracilis* (NSW) examined (and included in the discriminant analysis) had sepals which are much shorter than the petals and this is shown in the Bauer plate of *L. gracilis* published by Endlicher (1838).

*L. illecebrosa* Reichb. is worth considering here. It is stated to differ from *L. gracilis* in the larger scarious sheathing bases of the leaves and by being more woolly hairy. Bentham (1878) referred *L. illecebrosa* to *L. gracilis* as he could find no characters to distinguish the two taxa. Domin (1915) in his account of *Laxmannia*, provided a photograph of presumably type material of *L. illecebrosa* (Brisbane River, Am. Dietrich, Original von. *L. illecebrosa*). This material is referable to *L. gracilis* s. str. and the protologue description (Reichenbach 1871) states that the sepals are manifestly shorter than the petals, a character of *L. gracilis* s. str.

The second taxon accepted is here described as a new species.

**Laxmannia** R.Br., Prodr. 285 (1810) *nom. cons.* **Type:** *L. gracilis* R.Br. (*typ. cons.*)

*Bartlingia* F. Muell., J. & Proc. Roy. Soc. N.S.W. 15: 232 (1882) non Reichb. (1824)

**Laxmannia compacta** Conran & P. Forster, **sp. nov.**

Herba prostrata et ramulosa ad ca 10 cm alta; glaberrima ramosa, stolonifera longa ad ca 10 cm. Folia numerosa, sessilia, arcuata ad linearia, 4–51 mm longa, 1–2 mm lata. Inflorescentia adscendens, pedunculata, axillaris racemosus umbellus. Bractae involu-crorum numerosae 2–4 mm longae. Pedunculus ca 2–8 cm longus. Flores numerosi, rosi ad albi, ca 5 mm lati; pedicellares, pedicello 1–3 mm longo. Sepala 2–4 mm longa; filamenta ab sepalis libera, ad petala confluentia; antherae ca 0.25 mm longae, flavae. Ovarium obovatum glabrum, 0.5–1 mm latum; stylus filamentis, capitatus, 0.5–1 mm longa. Fructus 2–3 mm latus, ovatus ad globosus. Semina 2–3 mm longa. **Typus:** Burnett District: Boondooma 9145–340227, 45 km SSE of Mundubbera, “Rocky”, paddock, “Manar” Mundubbera Shire, 22 Nov 1984, *P.I. Forster* 1938 (holotypus BRI; isotypi AD, CANB, CBG, K, L, MEL, MO, NSW, NT, NY, P, PERTH, PRE, QRS, US, W).

A prostrate and branching herb to ca 10 cm high; branches glabrous, stoloniferous with stolons to ca 10 cm long. Leaves numerous and sessile in tufts; arcuate to linear, ca 4–51 mm long, 1–2 mm wide. Inflorescence erect, pedunculate, an axillary umbelliform raceme. Flowers numerous, pink to white, ca 5 mm across, pedicellate, pedicels 1–3 mm long. Sepals 2–4 mm long, 1.5–2.5 mm wide. Petals 2.5–5 mm long, 1–2 mm wide. Stamens 2–3 mm long; antisepalous filaments free from the sepals but antipetalous filaments confluent with the petals for most of their length; anthers ca 0.25 mm long, yellow. Ovary glabrous, obovate, 0.5–1 mm wide; style filamentous, capitate, 0.5–1 mm long. Fruit 2–3 mm wide, ovate to globose. Seeds 2–3 mm long. **Fig. 2.**

**Selected specimens:** Queensland. MORETON DISTRICT: Mt Emu, near Coolumb Beach, E of Yandina, May 1957, *Wilson* 624 (BRI)\*. WIDE BAY DISTRICT: Tin Can Bay, Aug 1943, *White* 12297 (BRI)\*. DARLING DOWNS DISTRICT: Jollys Falls, Portions 15 & 37V, Parish of Stanthorpe, Oct 1956, *Shea* 49 (BRI)\*. BURNETT DISTRICT: Eidsvold, 1913, *Bancroft* [BRI 146163] (BRI)\*. LEICHHARDT DISTRICT: ca 1.2 km NW of Mimosa Ck campsite, Blackdown Tableland, Aug 1971, *Henderson* 969 *et al.* (BRI)\*. New South Wales. NORTH COAST: 55 miles [88 km] NW of Grafton on Gwydir Hwy, Gibraltar Ra., Dec 1966, *Tindale* s.n. (NSW)\*. CENTRAL COAST: Cheltenham, Nov 1954, *Johnson* s.n. (NSW)\*. NORTH WEST SLOPES: 0.5 mile [0.8 km] W of Coonabarabran, Oct 1966, *Briggs* 901 (NSW). NORTHERN TABLELANDS: Yarraford, near Glen Innes, Jan 1911, *Kenny* [BRI 084684]\*. SOUTHERN TABLELANDS: Burrier, Shoalhaven R., Oct 1931, *Rodway* 591 (NSW). SOUTH COAST: Linden, 27 Nov 1965, *Coveny* s.n. (NSW)\*.

**Ecology:** The type was collected at 480 m alt. in open heathland among rock crevices and ledges on a southwestern slope growing among *Schoenus brevifolius* R.Br. Associated vegetation included *Melaleuca sieberi* Schauer, *Pultenaea petiolaris* Cunn. ex Benth., *Trachymene procumbens* (F. Muell.) Benth., *Platysace lanceolata* (Labill.) Druce, *Astrotriche pterocarpa* Benth. and *Olaix stricta* R.Br. The habitat is seasonally waterlogged but becomes desiccated during the dry season in late winter and early spring. Collections from throughout this species' range have been recorded mainly from various heathland communities, with some collections from *Eucalyptus* open forest on sandstone.

**Etymology:** Named from the compact tufted nature of the leaves.

**Conservation Status:** This species is widespread and represented in a number of Conservation Reserves and is not considered endangered at present.

**Laxmannia gracilis** R.Br., Prodr. 286 (1810); Endl., Iconogr. t. 97 (1838); Schnizlein, Icon. fam. nat. 1: t. 55d, fig. 2–10 (1849); F. Muell., Fragm. 7: 88 (1870); Benth., Fl. Austral. 7: 65 (1878); Engler & Prantl., Natürl. Pflfam. 11 5: fig. 32 D–G (1888); Bailey, Qd Flora 5: 1638–1639 (1902); Domin, Bibl. Bot. 85: 522–523 fig. 110 (1915); Burbidge & Gray, Fl. A.C.T. fig. 95 (1970). *Bartlingia gracilis* (R.Br.) F. Muell., Key Syst. Vict. Plant. 1: 436 (1888). **Type:** Port Jackson, Iter Australiense, R. Brown (isotype: K (photo), NSW, MEL).

*L. illecebrosa* Reichb., Beitr. Syst. Pflanzenk. 72 (1871). **Type:** Brisbane River, A. Dietrich n.v.

An erect, branching herb to 40 cm high; branches glabrous, adventitious roots present but the plants not stoloniferous. Leaves numerous and sessile, scattered or in clusters along the stems; linear, 8–60 mm long, 1–2 mm wide. Inflorescence erect, pedunculate, an axillary umbelliform raceme. Involucral bracts few, 1–3 mm long. Peduncle 2–20 cm long. Flowers few to numerous, white to pink, 6–8 mm wide, pedicellate; pedicels 1–3 mm long. Sepals 4–6 mm long, 2–3 mm wide. Petals 5–8 mm long, 2.5–4 mm wide.

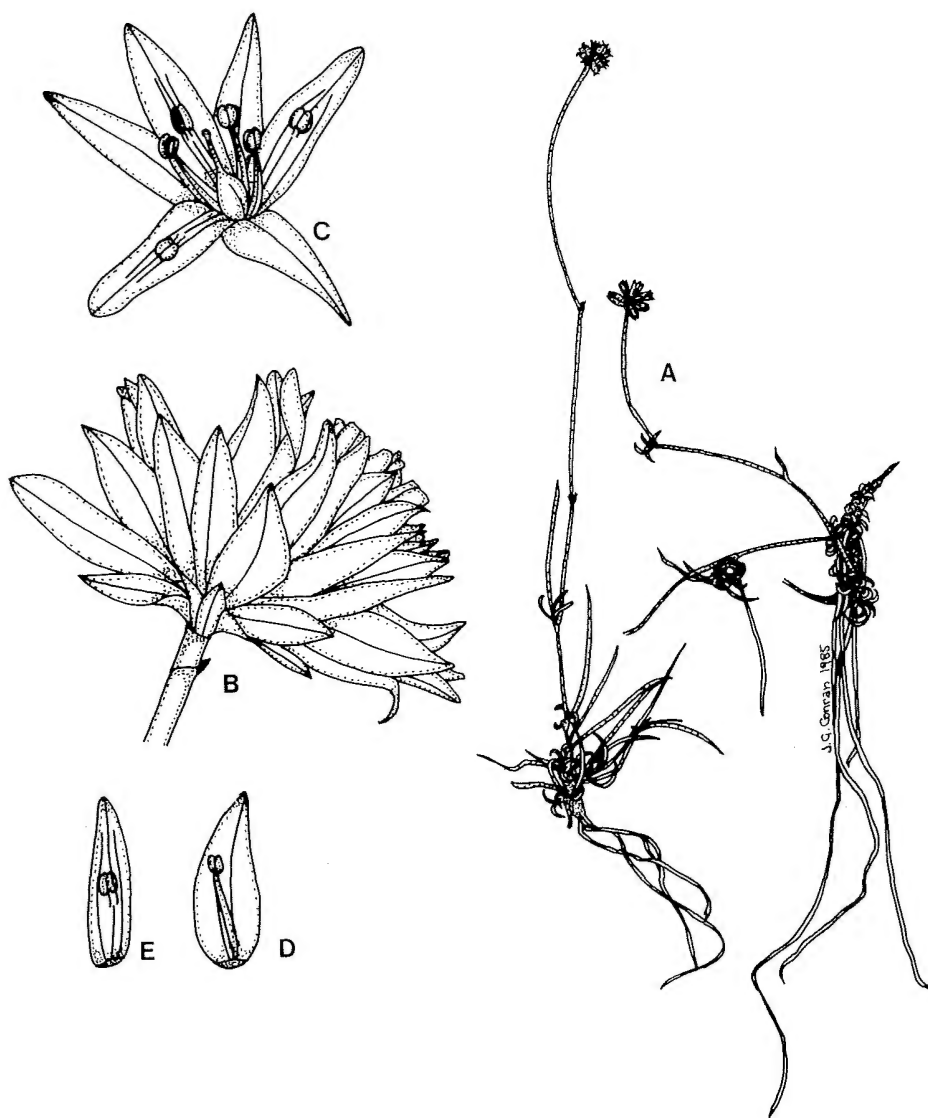


Fig. 2. *Laxmannia gracilis*: A. habit  $\times 2/3$ . B. inflorescence  $\times 7$ . C. flowers (opened artificially)  $\times 7$ . D. sepal with anther  $\times 7$ . E. petal with basally epipetalous anther  $\times 7$ . A from Brown s.n., Port Jackson. B-E from Conran s.n., Mt Coot-tha.



Stamens 3–5 mm long; antisepalous filaments free from the sepals but antipetalous filaments fused to the petals at the base only; anthers 0.5–1 mm long, yellow. Ovary glabrous, globose to ovoid, slightly 3-lobed, 1–2 mm wide; style filamentous with stigma capitate, 1.5–3 mm long. Fruit 2–3 mm wide, ovate to globose. Seeds 2–3 mm long. Fig. 3.

A chromosome count of  $2n = 24$  was recorded on the herbarium label for *B. Briggs* s.n. [NSW 89417].

**Selected specimens:** Queensland. MORETON DISTRICT: St Peters Lutheran College Property, 5 km NE of Crows Nest on Black Creek, Jan 1973, *Sharpe* 296 (BRI)\*. WIDE BAY DISTRICT: 11 km N of Coalstoun Lakes on tableland road, Biggenden Shire, Apr 1983, *Forster* 1558 (BRI, BRIU)\*. BURNETT DISTRICT: 47.2 km from Eidsvold on road to Cracow, Eidsvold Shire, Sep 1983, *Forster* 1641 (BRIU)\*. DARLING DOWNS DISTRICT: Moonie Hwy, 16 km W of Westmar, Oct 1975, *Williams* 75081 (BRI)\*. LEICHHARDT DISTRICT: Near Mimosa Ck campsite, Blackdown Tableland, Apr 1971, *Henderson* 590 *et al.* (BRI)\*. MARANOVA DISTRICT: 39 km from Roma on Injune road, May 1975, *Simon* 2858 *et al.* (BRI). MITCHELL DISTRICT: Warlus area C, Site 338, 50 km W of Tambo, Aug 1975, *Beeston* 1332C (BRI). NORTH KENNEDY DISTRICT: Herberton, Feb 1918, *Michael* 374 (BRI)\*. BURKE DISTRICT: Near source of Poison Creek, ca 90 miles [144 km] N of Hughenden, Apr 1935, *Blake* 8467 (BRI). New South Wales. NORTH COAST: Tabulam to Tenterfield Rd, ca 10 miles [16 km] W of Tabulam, Jan 1971, *Salasoo* 4612 (NSW)\*. CENTRAL COAST: 0.5 mile [0.8 km] S of Wiseman's Ferry, Oct 1965, *Briggs* [NSW 89417] (NSW). NORTH WEST SLOPES: Warrumbungle Ranges, Jan 1883, *Betche* s.n. (NSW). NORTHERN TABLELANDS: Torrington, Jan 1911, *Boorman* s.n. (NSW). NORTH WEST PLAINS: Narrabri, Feb 1899, *Maiden* s.n. (NSW). SOUTHERN TABLELANDS: Tuross R., 5 miles [8 km] S of Countegany, Dec 1967, *Briggs* 3208 (NSW). SOUTH COAST: Pinnacle Mt, 8 miles [5 km] NNW of Grenfell, Mar 1956, *Constable* [NSW 37906] (NSW)\*. Victoria. East Gippsland, SE side of Glenmaggie view, 8 km NNE of Heyfield, Nov 1973, *Beauglehole* 43356 *et al.* (NSW, MEL).

**Ecology:** *L. gracilis* occurs in a range of vegetation communities but is commonly found in eucalypt open forest of poor sandy soils or clay loams, often with *Eucalyptus microcarpa* (Maiden)Maiden, *E. crebra* F. Muell. and *Angophora costata* (Gaertner)J. Britten.

**Conservation Status:** *L. gracilis* is widespread and well represented in Conservation Reserves.

Williamson (1928) proposed a varietal epithet *nana* under the name *Bartlingia gracilis* for dwarf specimens from the Mt William area of the Grampians. The type of this varietal name (Summit, Mt William, Nov 1900, H.B. Williamson [MEL 51804]) designated by G. Keighery (but unpublished) appears to be a shortly pedunculate form of *L. sessiliflora* and the description on the herbarium label distinguishes it from *L. gracilis* on the basis of its short peduncles. Willis (1962) considered *B. gracilis* var. *nana* to be based merely on depauperate specimens from high altitudes (ca 1200–1500m). Comparison of the specimens at MEL reveals that the 7–15 mm peduncles of the variety grade into the sessile to 10 mm peduncles of *L. sessiliflora*, and the plants appear to be otherwise identical, especially on perianth lengths and shape. The name *B. gracilis* var. *nana* would therefore be best placed in synonymy with *L. sessiliflora*.

*L. gracilis* and *L. compacta* can be distinguished from each other by the following key:

1. Sepals and petals  $\pm$  equal; inner stamen whorl strongly epipetalous; plants  $\pm$  compact or procumbent . . . . . ***L. compacta***
- Petals longer than sepals; inner stamens weakly epipetalous; plants  $\pm$  caulescent and erect . . . . . ***L. gracilis***

#### Acknowledgements

We would like to thank Mr Nicholas Lander who, while Australian Botanical Liaison Officer at Kew, examined material at K for us, Mr Les Pedley (BRI) for arranging loan of material and the Directors of BRI, BRIU, NSW and MEL for access to material.

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Fig. 3. *Laxmannia compacta*: A. habit  $\times 4/5$ . B. inflorescence  $\times 7$ . C. flowers (opened artificially)  $\times 7$ . D. sepal with anther  $\times 7$ . E. petal with epipetalous anther  $\times 7$ . All from Forster 1935.

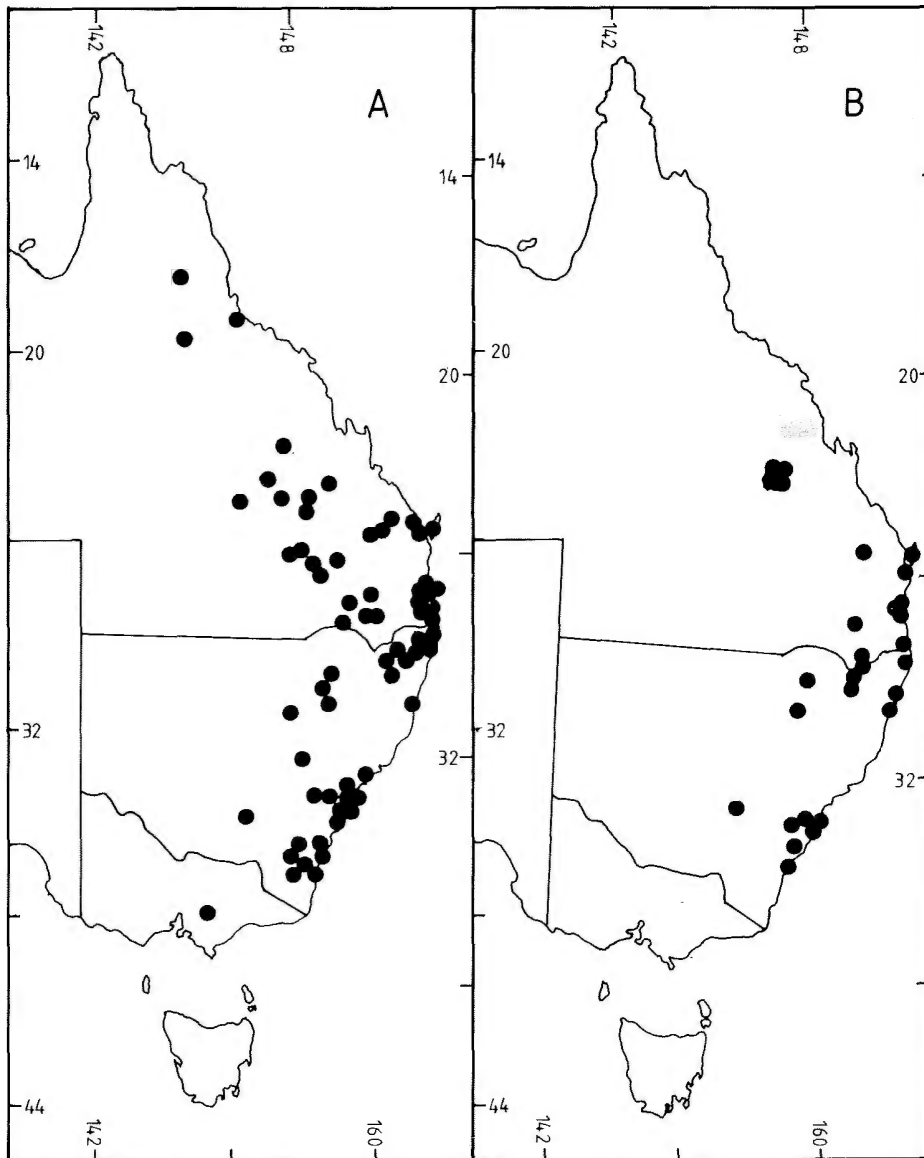


Fig. 4. Distribution of known sites of collection of A. *Laxmannia gracilis* and B. *L. compacta*.

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### Index to Collectors

Collections of *Laxmannia gracilis* and *L. compacta* in the Queensland Herbarium (BRI); Herbarium of the Botany Department, University of Queensland (BRIU); Royal Botanic Gardens and National Herbarium, Sydney (NSW); Royal Botanic Gardens and National Herbarium, Melbourne (MEL).

#### 1. *Laxmannia compacta*

Adams, L.G. 1477 (NSW); Althofer, G.W. 141 (NSW)\*; Bancroft, T.L. (BRI 146163)\*; Bert, W. s.n. (NSW); Betche, E. s.n. (NSW)\*; Blakely, W.F. s.n. (NSW); Boorman, J.L. s.n., Feb 1904 (NSW)\*; Oct 1901 (NSW)\*; Briggs, B.G. 901 (NSW); Burgess, C. s.n. (NSW, CANB 018429); Camfield, J.H. s.n. Oct 1908 (NSW), s.n. Oct 1901 (NSW); Clemens, M.S. (BRI 017562)\*; Coveny, R.G. s.n. (NSW)\*; Coveny, R. & Haegi, L. 9969 (BRI)\*; Dodge, P.H. s.n. (NSW)\*; Floyd, A. s.n. (NSW)\*; Gittins, C.H. 378 (BRI)\*; Hamilton, A.A. s.n. (NSW), s.n. Oct 1901 (NSW); Harold, A.G. C064 (BRI)\*; Henderson, R. 969 et al. (BRI)\*; Hockings, F.D. (BRI 031501)\*; Hubbard, C.E. 3877 (BRI)\*; Kerridge, P.C. (BRIU 4197); Johnson, L.A.S. s.n., 22 Oct 1953, (NSW)\*; s.n., 25 Nov 1954, (NSW)\*; s.n., 20 Oct 1946 (NSW)\*; s.n., 5 Jan 1951 (NSW)\*, 18961 (NSW); Kenny, F.H. (BRI 084684)\*; Lemberg, R. s.n. (NSW); McComish, J.D. s.n. (NSW); Pearson, S. 26 (BRI)\*; Phillips, M.E. 21502 (BRI)\*; Powell, J.M. & Armstrong, J. 914 (BRI)\*; Rodd, A. 1628 (NSW); Rodway, F.A. 390 (NSW); Rose, A.B. 1 (NSW); Rumsey, H.J. s.n. (NSW); Rupp, H.M.R. (NSW 8107/13)\*; Salasoo, H. 1636 (NSW)\*; Sharpe, P. 1277 (BRI); Shea, K.N. 49 (BRI)\*; Streinham, H. 826 (NSW, CANB); Tindale, M. s.n. (NSW)\*; White, C.T. 12297 (BRI)\*; Williams K.A. 74031 (BRI)\*, 80214 (BRI)\*; Wilson, C.L. 624 (BRI)\*; ex Herb. O.W. Sonder (MEL 51795).

#### 2. *Laxmannia gracilis*

Adams, L.G. (BRI 146168)\*; Bailey, F.M. (BRI 146153)\*; Ballingall, M.E. 1099 (BRI); Bandorlan, W. 55 (MEL); Bates, L.K. 552 (BRI)\*; Beauglehole, A.C. 37710 & Rogers, K.C. (MEL); Beauglehole, A.C. 43356 et al. (NSW, MEL); Beeston, G.R. 1332c (BRI); Bell, C. 531 (BRI); Beuzeville, W.A.W. de (NSW 5615/15)\*; Betche, E. s.n. (NSW)\*; Blake, S.T. (BRI 080922)\*, 4060A (BRI), 2375 (BRI), 8467 (BRI); Blakely, W.F. & Shiress, D.C.W. s.n. (NSW); Boorman, J.L. (BRI 146167)\*, s.n. Oct 1899 (NSW)\*, s.n. Oct 1904 (NSW), s.n. May 1916 (NSW)\*, s.n. Jan 1911 (NSW)\*; Briggs, B.G. s.n., 14 Nov 1965 (NSW)\*, 17 Oct 1965 (NSW 89417)\*, 3208 (NSW)\*; Briggs, B.G.R. 474 (NSW); Camfield, J.H. s.n. (NSW)\*; Cheel, E. s.n. (NSW)\*; Conran, J.G. s.n. (BRIU)\*; Constable, E.F. (NSW 37906)\*, 6480 (NSW)\*; Costin, A.B. s.n. (NSW); Coveny, R. 8553 (NSW), 11824 (NSW)\*; Coveny, R. 7562 et al. (NSW); Cribb, A.B. (BRIU 4199), (BRIU 4201); Durrington, L. 1215 et al. (BRI); Dywer, J.W. s.n. (NSW 8277/15)\*; Everist, S.L. 1030 (BRI)\*; Forster, P.I. 1558 (BRI, BRIU)\*, 1641 (BRIU)\*; Garvey, J. 29 (BRI); Gillieatt, J. 28 (BRI); Hamilton, A.A. s.n. (NSW)\*; Henderson, R. 183 (BRI)\*, 590 (BRI)\*; Howcroft, M. (BRI 026573); Hubbard, C.E. 3587 (BRI); Jackes, B. Y10 (BRI); Johnson, L.A.S. 30380 et al. (BRI)\*; Johnson, R.W. 427 (BRI)\*, 2279 (BRI)\*, 1140 (BRI), 670 (BRI); Keys, J. 80 (BRI)\*; Maiden, J.H. s.n. (NSW)\*; Maiden, J.H. & Boorman, J.L. s.n. (NSW)\*; McAuliffe, D.J. (NSW 10993/16); McBonnon, E.J. 5304 (NSW)\*; McKee, H.S. 7612 (NSW)\*; Michael, N. 1739 (BRI)\*, 374 (BRI)\*, 1945 (NSW)\*; Morain, S.A. 154 (BRI)\*; O'Keefe, B. (BRI 290997); Rodd, A. 1502 (NSW)\*, 2271 (NSW)\*; Rodway, F.A. s.n., 2 Jan 1946 (NSW)\*, s.n., Feb 1917 (NSW)\*, s.n. 3 Aug 1945 (NSW)\*, s.n. Mar 1921 (NSW)\*, 591 (BRI)\*; Rogers, K.C. (MEL 600033), (MEL 600558), (MEL 600503); Salasoo, H. 4612 (NSW)\*, 2368 (NSW)\*; Schneider, H. (BRI 146157)\*; Sharpe, P. 296 (BRI), 668 (BRI)\*, 834 (BRI); Simon, B.K. 2858 et al. (BRI)\*; Smith, D.A. 14 (BRI); Spurgin, M. (BRIU 4200); Thomas, M. (BRI 121412); Thompson, J. 6 et al. (BRI); Tindale, M. (NSW 48852); Tothill, J.C. N34 (BRI); Trapnell 141 et al. (BRI)\*; Wakefield, N.A. 2450 (MEL); Whaithe, T. & J. 3447 (NSW)\*; White, C.T. (BRI 146162), (BRI 146165); (BRI 146158)\*, (BRI 146154)\*; Whyte, A. (BRIU 4721); Williams, K.A. 75081 (BRI)\*; Willis, J.H. s.n. (MEL); Collector unknown (MEL 51807).

## A REVISION OF *MELALEUCA* L. (MYRTACEAE) IN NORTHERN AND EASTERN AUSTRALIA, 3.

N.B. Byrnes

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### Summary

*Melaleuca alternifolia* (Maiden & Betcher) Cheel, *M. arcana* S.T. Blake, *M. argentea* W.V. Fitzg., *M. armillaris* (Sol. ex Gaertner) Smith, *M. bracteata* F. Muell., *M. cajuputi* Powell, *M. capitata* Cheel, *M. dealbata* S.T. Blake, *M. deanei* F. Muell., *M. decora* (Salisb.) J. Britten, *M. diosmatifolia* Dum-Cours., *M. ericifolia* Smith, *M. groveana* Cheel & White, *M. howeana* Cheel, *M. kunzeoides* Byrnes, *M. lanceolata* Otto, *M. leucadendra* (L.) L., *M. linophylla* F. Muell., *M. nervosa* Lindley, *M. parvistaminea* Byrnes, *M. pustulata* J.D. Hook., *M. saligna* Schauer, *M. sericea* Byrnes, *M. sieberi* Schauer, *M. squamea* Labill., *M. stenostachya* S.T. Blake, *M. styphelioides* Smith, *M. viminalis* (Sol. ex Gaertner) Byrnes are described and maps of their distributions given. *M. quinquenervia* (Cav.) S.T. Blake is included in *M. viridiflora* (as *M. viridiflora* var. *rubriflora* Brong. & Gris). Four other varieties of the species are recognised. *Callistemon viminalis* is referred to *Melaleuca* (as *M. viminalis* (Sol. ex Gaertner) Byrnes).

This is the last of a series of three papers. The others appeared in *Austrobaileya* 2: 65-76 (1984) and *Austrobaileya* 2: 131-146 (1985). Detailed descriptions of some taxa whose names were validated in the first paper are given. The map numbers correspond with the species numbers.

32. *M. nervosa* (Lindley) Cheel, Proc. Roy. Soc. N.S.W. 78: 65 (1944); S.T. Blake, Cont. Qd Herb. 1: 43 (1968). Based on *Callistemon nervosus* Lindley in Mitch., Trop. Aust. 235 (1848). Type: Queensland, Balmy Creek, Jul 1846, Mitchell 241 (holo CGE, iso MEL, NSW).

Synonyms: see S.T. Blake (*loc. cit.*).

Shrub or tree to 10 m high. Bark layered, fibrous and papery. Branchlets tomentose with short and long hairs. Leaves scattered, flat, narrowly to very broadly obovate or elliptical, acute to obtuse, commonly apiculate, narrowly attenuate to cuneate at base, 30-120 mm long, 5-30 mm wide, tomentose with long weak and short crisp hairs, glabrescent, 3-7-veined, oil glands obscure; petioles 4-10 mm long, usually retaining indumentum. Inflorescence a many-flowered, open or dense terminal or upper axillary spike, often 2-4 together; flowers in triads; rachis densely villous, growing out after anthesis; bracts ovate, to 8 mm long, striate, villous with glabrous margins, caducous; bracteoles absent. Calyx tube turbinate to cylindrical, 1.8-3 mm long and wide, densely tomentose; lobes broadly triangular, to 1 mm long, tomentose, usually without hyaline margins. Petals white, yellow or red, elliptical to nearly circular, without claws, to 4 mm long. Stamens usually yellow-green or red; claw 0.5-2 mm long (sometimes with free stamens); filaments 3-5(-7) attached to margin of each claw; free part to 20 mm long. Style to 20 mm long, glabrous; stigma capitate. Ovary to 2 mm long, pubescent above. Fruit cup-shaped, 24 mm long and wide, orifice 1-3 mm diam., calyx lobes deciduous; in open or dense spikes.

*Melaleuca nervosa* has a wide range of forms which are partly genetically and partly ecologically determined. Intermediates between these forms are common but because the forms are distinct in appearance in the field and occur in comparatively large populations in pure stands their recognition is warranted (see key).

*M. nervosa* f. *nervosa* is usually a shrub with erect branchlets and a more fibrous than papery bark. It is found growing in drier localities; that is, in desert regions or on stony or sandy ridges.

Selected specimens. Western Australia. 27 miles [43 km] SW of Luluigui Station, Kimberley, Sep 1959, Lazarides 6543 (BRI). Northern Territory. 35 miles [56 km] SSE of Victoria River Downs, Jun 1949, Perry 2145 (BRI); near Tennant Creek, Jun 1946, Blake 15986 (BRI). Queensland. BURKE DISTRICT: 13 miles [21 km] SW of Croydon Township, Aug 1953, Perry 3927 (BRI). NORTH KENNEDY DISTRICT: 1.5 miles [2 km] W of Pentland, Jun 1953, Perry 3566 (BRI).

*Melaleuca nervosa* f. *latifolia* Byrnes, *Austrobaileya* 2: 74 (1984). Type: Northern Territory, about SE of Brocks Creek, Jul 1946, Blake 16344 (BRI, holo).

This form is similar to *f. nervosa* but differs in having broader more distinctly obovate leaves sometimes up to 40 mm wide. It is common on heavy soils which are seasonally flooded.

**Selected specimens.** Western Australia. Near Beagle Bay Mission, Kimberley, Sep 1959, *Lazarides* 6560 (BRI). Queensland. COOK DISTRICT: Bathurst Bay, Jul 1972, *Hyland* 6303 (BRI). PORT CURTIS DISTRICT: 4 miles [6 km] N of Marlborough Township, Jun 1963, *Lazarides* 6878 (BRI); Curtis Island, Apr 1962, *Home* s.n. (BRI).

**Melaleuca nervosa f. pendulina** Byrnes, *Austrobaileya* 2: 74 (1984). **Type:** Queensland. Cook District: Coen, Aug 1948, *Brass* 19778 (BRI, holo).

This form is usually a pendulous tree with papery bark growing on levees. It has commonly been confused with *M. argentea* but differs from this species in having fewer stamens, usually less than 25 per flower, and having a less persistent indumentum on the leaves consisting of short crispid hairs and longer straight hairs.

**Selected specimens.** Northern Territory. Nicholson R. area, Jun 1974, *Henshall* 303 (BRI); 62 miles [99 km] 149° from Darwin, Aug 1965, *Story* 7789 (BRI). Queensland. COOK DISTRICT: Laura R., Laura, Jun 1971, *Hyland* 5204 (BRI). PORT CURTIS DISTRICT: Auckland Ck, Gladstone, Jun 1960, *Trapnell* 14 (BRI).

Intergrades among all three forms can be found and specimens may be hard to identify, but usually populations can be readily distinguished in the field. Indications are that ecological conditions influence the growth pattern of the plants.

**33. Melaleuca dealbata** S.T. Blake, *Cont. Qd Herb.* 1:41 (1968). **Type:** Northern Territory. ca 12° 40'S, 131° 25'E, Sep 1946, *Blake* 17000 (holo, BRI).

Tree to 25 m high. Bark layered, papery. Branchlets densely tomentose with short crispid hairs. Leaves scattered, flat, broadly elliptical to broadly obovate, acute, commonly apiculate, attenuate at base, 50–120 mm long, 10–32 mm wide, densely tomentose with short crispid hairs and few long straight hairs mainly near margin, hairs usually semi-persistent (some trees leaves glabrescent early), 3–9-veined, usually visible, oil glands obscured by indumentum; petioles 6–10 mm long, tomentose. Inflorescence a usually open, many-flowered, upper-axillary or terminal spike, often several together; flowers in triads; rachis densely tomentose, usually growing out at anthesis (some not growing out at all); bracts narrowly triangular, tomentose, caducous; bracteoles absent. Calyx tube cylindrical to turbinate, 2–2.5 mm long, 2.5–3.5 mm wide, densely tomentose; lobes triangular to ovate, 0.8–1.6 mm long, densely tomentose. Petals white, broadly elliptical, 2.5–3.5 mm long. Stamens white, glabrous; claw 0.8–2 mm long; filaments 4–9 attached to margin of each claw, free part to 8 mm long. Style 8–10 mm long, glabrous, stigma capitate. Ovary to 1.5 mm long, pubescent above. Fruit barrel or cup-shaped, 3–4 mm long and wide, orifice 1.5–2 mm diam.; calyx lobes absent; in open elongate spike.

Northern Australia including Arnhem Land, Northern Territory, Cape York Peninsula and the east coast of Queensland south to Fraser Island; also in New Guinea.

**Selected specimens.** Northern Territory. Bank of Howard R., Sep 1946, *Blake* 16949 (BRI). Queensland. COOK DISTRICT: Lankelly Ck, 13° 55'S, 143° 15'E, Oct 1969, *Webb & Tracey* 9688 (BRI). WIDE BAY DISTRICT: Fairymead, near Bundaberg, Oct 1948, *Smith* 4147 (BRI).

This species is usually persistently hoary and so easily distinguished from related species in the field but early glabrescent populations have been found in the Northern Territory.

**34. Melaleuca stenostachya** S.T. Blake, *Cont. Qd Herb.* 1:50 (1968). **Type:** Burke District: Croydon, Jul 1954, *Blake* 19566 (BRI, holo).

Shrub or small tree to 8 m high. Bark layered, fibrous and/or papery. Branchlets tomentose, glabrescent. Leaves scattered, flat, narrowly ovate to narrowly obovate, acute to acuminate, often apiculate, narrowly cuneate at base, 30–140 mm long, 4–14 mm wide, appressed sericeous, soon glabrescent, 3–7-veined, oil glands often obscure; petioles to 4 mm long. Inflorescence a many-flowered, dense to open, upper-axillary or terminal spike, often 2–4 together; flowers in triads; rachis villous, usually growing out after anthesis; bracts caducous (not seen); bracteoles absent. Calyx tube campanulate, 1–1.6 mm long, ca 1 mm wide, pubescent; lobes ovate, to 1.1 mm long, partly pubescent with hyaline ciliate margins. Petals white, broadly ovate to circular with or without short claw, ca 2 mm long. Stamens white, glabrous; claw 1–2 mm long (sometimes split or stamens free); filaments 5–9 attached to margin of each claw; free part to 7 mm long. Style 6–8 mm long, glabrous; stigma small. Ovary ca 1 mm long, pubescent above. Fruit cup or barrel-

shaped, to 2.5 mm long and 3 mm wide, orifice 1.5 mm diam.; calyx lobes usually deciduous; borne in an open spike.

**Melaleuca stenostachya** var. **stenostachya** is usually an erect, hard-barked shrub with narrow, closely spaced leaves found growing on heavy or skeletal soils in drier areas.

North-eastern Australia including the southern Gulf of Carpentaria and Cape York Peninsula.

**Specimens examined.** Northern Territory. 24 miles [39 km] N of Macarthur River Stn, Jul 1948, *Perry* 1776 (BRI). Queensland. BURKE DISTRICT: Settlement Ck, May 1923, *Brass* 363 (BRI); 6 miles [10 km] W of Westmoreland Stn, Jun 1948, *Perry* 1334 (BRI). COOK DISTRICT: near Chillagoe, Apr 1938, *Blake* 1364 (BRI).

**Melaleuca stenostachya** var. **pendula** Byrnes, *Austrobaileya* 2: 74 (1984). **Type:** Queensland. Cook District: Jacky Jacky airstrip, Bamaga District, May 1962, *Webb & Tracey* 5989 (BRI, holo).

North-eastern Australia including Cape York Peninsula and Torres Strait Islands.

**Specimens examined.** Queensland. COOK DISTRICT: Lockerbie, 10 miles [16 km] WSW of Somerset, Apr 1948, *Brass* 18350 (BRI); bank of lagoon near Karumba Rd, Jul 1977, *Craven & Pajmans* 4801 (BRI); Badu Is., Torres St, Dec 1979, *Garnett* 284 (BRI); Friday Is., near Prince of Wales Is., Nov 1966, *Hindmarsh & Wolloston* 118 (BRI); Rutland Plains near mouth of Mitchell R., *Whitehouse* (BRI).

The two varieties are usually distinct but some intermediates may be present. The variation is apparently related to the ecological conditions.

**35. Melaleuca sericea** Byrnes, *Austrobaileya* 2: 74 (1984). **Type:** Western Australia. 9.5 miles [15 km] W of Tableland Station, Apr 1955, *Lazarides* 5133 (BRI, holo; CANB, iso).

Shrub or small tree to 5 m high. Bark layered, papery. Branchlets densely villous. Leaves scattered, flat, narrowly obovate to obovate, obtuse to acuminate, apiculate, cuneate at base, 15–50 mm long, 2–10 mm wide, appressed sericeous, glabrescent at length, 3–5-veined, often obscure, oil glands visible with lens on older leaves; petioles to 3 mm long, poorly defined. Inflorescence a few- to many-flowered dense or open upper-axillary or terminal spike; flowers in triads; rachis villous, growing out before anthesis; bracts variable, caducous sometimes replaced by leaves; bracteoles absent. Calyx tube campanulate 1.5–2 mm long, villous; lobes ovate to triangular, 0.8–1.2 mm long, sericeous including narrow margins. Petals white, nearly circular with or without claw, ca 1.5 mm long. Stamens white, glabrous; claw 2–2.5 mm long; filaments 8–11 attached to the upper margin of each claw, to 5 mm long. Style ca 8 mm long, glabrous; stigma capitate. Ovary 1–1.5 mm long, pubescent above. Fruit cup-shaped to urceolate, to 2.5 mm long and 2 mm diam., orifice 1–1.2 mm diam.; calyx lobes and indumentum usually retained at maturity; in an open or dense spike.

North Australia from the Kimberley area of Western Australia to Victoria River area of Northern Territory.

**Specimens examined.** Western Australia: 45.5 miles [73 km] W of Tableland Stn, Apr 1955, *Lazarides* 5139 (BRI, CANB); near Karunje Stn, Sept 1954, *Speck* 5006 (BRI); Kuranje Stn, East Kimberley, Jan 1955, *Rust* 92 (CANB). Northern Territory. 20 miles [32 km] SW of Auvergne Stn, Aug 1949, *Perry* 2683 (BRI); 18 miles W of Timber Creek, Jan 1971, *Byrnes* 2025 (BRI, DNA); 66 miles E of W. Aust. border, Sep 1969, *Everist* 9248 (BRI) & *Byrnes* 1715 (DNA); Keep R. May 1972, *Aldrick* (DNA).

This species differs from *M. stenostachya* in having a more persistent indumentum on leaves, branchlets, calyx lobes and fruits, longer staminal claws and a shorter flowering spike. The flowering spikes are usually only borne singly and the rachis invariably grows out before anthesis with well developed leaves so that it appears subterminal. *M. sericea* can be mistaken for *M. lasiandra* but it does not have the hairy stamens of that species.

**36. Melaleuca cajuputi** Powell, *Pharm. Lond. Transl.* 22 (1809); *Blake, Cont. Qd Herb.* 1:22 (1968). **Type.** Description and figures in *Rumph., Herb. Amboin* from plants from the Moluccas.

Synonyms: see S.T. *Blake (loc. cit.)*.

Shrub or usually a tree to 25 m high. Bark layered, fibrous and papery. Branchlets patent villous. Leaves scattered, flat, narrowly to broadly ovate or obovate, acute, often apiculate, attenuate at base, 45–120 mm long, 8–20 mm wide (wider outside Australia), villous,

glabrescent or glabrous; oil glands usually obscure; petioles to 7 mm long. Inflorescence a many-flowered terminal or upper-axillary spike, usually single, sometimes 2–3 together; flowers in triads; rachis villous, growing out at anthesis; bracts ovate, striate, villous, caducous; bracteoles absent. Calyx tube turbinate to sub-cylindrical, to 2 mm long and wide, pubescent; lobes semicircular to triangular, 0.5–0.7 mm long, pubescent with glabrous thin margin. Petals broadly obovate, clawed, to 2.5 mm long. Stamens white, glabrous; claw 1–2 mm long; filaments 7–10 attached to the upper margin of each claw, free part to 8 mm long. Style 6–9 mm long, glabrous; stigma small. Ovary *ca* 1 mm long, pubescent above. Fruit cup-shaped to globose, to 3 mm long and 4 mm wide, orifice 1.5–2 mm diam.; calyx lobes deciduous; usually in dense spikes.

Southern Asia to northern Australia including Western Australia, Northern Territory, Queensland north of 18°S latitude; also cultivated beyond its natural range.

**Selected specimens.** Northern Territory. Reynolds R., May 1969, *Byrnes* 1629 (BRI); Yirrkala, Aug 1948, *Specht* 857 (BRI). Queensland. COOK DISTRICT: Sanamere Lagoon, Jardine R., May 1948, *Brass* 18854 (BRI); 6 km from Cooktown, Cairns Rd, Apr 1975, *Craven* 3206 (BRI).

37. *Melaleuca argentea* W.V. Fitzg., Western Mail (Perth), 16 Jun 1906 & also J. Roy. Soc. W. Aust. 3:187 (1918); Blake, Cont. Qd Herb. 1:47 (1968). **Type.** Western Australia: base of Mt Bartlett, Sep 1905, *Fitzgerald* 1258 (NSW, holo; K, PERTH, iso).

*M. leucadendron* var. *angustata* Riviere, Bull. Soc. Nat. Acclim. France 3:537, f. 2 (1882). **Type:** (P? *n.v.*).

Tree to 25 m high. Bark layered, papery. Branchlets appressed sericeous, pendulous. Leaves scattered, flat, narrowly elliptical to narrowly obovate, acute, apiculate, narrowly cuneate or attenuate at base, 50–150 mm long, 6–20 mm wide, appressed sericeous with long straight hairs only, at length glabrescent, 3–9-veined, oil glands obscure; petioles 4–10 mm long, usually retaining indumentum. Inflorescence a many-flowered, open, upper-axillary or terminal spike, 1–4 together; flowers in triads, rachis pubescent and usually growing out before anthesis (some not growing at all out); bracts ovate to triangular, to 10 mm long, appressed pubescent or sericeous, caducous; bracteoles absent. Calyx tube cylindrical to campanulate, 1.6–2.5 mm long and wide, pubescent, rarely glabrous, lobes semicircular to broadly ovate, 1–1.5 mm long usually pubescent including hyaline margins. Petals white, broadly obovate with broad claw, 2.3–4 mm long. Stamens white, glabrous; claw 1–2 mm long; filaments 6–9 attached to margin of each claw, free part to 12 mm long. Style 12–15 mm long, glabrous; stigma capitate. Ovary to 1.5 mm long, pubescent above. Fruit cup-shaped or cylindrical, 2.5–4 mm long and wide, orifice 2–3 mm diam., calyx lobes absent; in an open spike.

Northern Australia from Gascoyne River, Western Australia to Cape York Peninsula, Queensland and New Guinea, usually restricted to creek or river banks.

**Selected specimens.** Western Australia. Karunjie Station, Jul 1952, *Perry* 3149 (BRI). Northern Territory. 20 miles [32 km] W of Katherine, Sep 1961, *Speck* 1662 (BRI); Settlement Ck, Sep 1922, *Brass* 229 (BRI). Queensland. COOK DISTRICT: Chillagoe, near old smelter, Aug 1965, *Carolyn* 4806 (BRI).

This species has been confused with both *M. nervosa* and *M. dealbata* but differs from both in having no short crisp hairs mixed with the long straight hairs on the leaf lamina. Blake confused the narrow-leaved form, *M. nervosa* f. *pedulina*, with this species and stated in his paper that *M. argentea* had crisp hairs. Both taxa grow together on the river banks of northern Queensland and do appear similar, but the indumentum without crisp hairs is more persistent and there are more stamens in *M. argentea*. The two species are difficult to distinguish from each other in the absence of flowers or young leaves.

38. *Melaleuca leucadendra* (L.)L., Mant. 1:105 (1767); S.T. Blake, Cont. Qd Herb. 1:17 (1968). **Type:** Arbor alba Rumphius, Herb. Amboin. 2:72, t. 16, 17. f. 1, figure & description of plant from the Moluccas.

Synonyms: see Blake (*loc. cit.*).

Tree to 30 m high. Bark layered, papery. Branchlets glabrous or sericeous, glabrescent early, pendulous. Leaves scattered, flat, narrowly ovate to elliptical, acute, often shortly



apiculate, narrowly attenuate at base, 80–230 mm long, 9–40 mm wide, thin, glabrous or sometimes sericeous when very young, 5–9-veined, oil glands obscure or visible with lens, petioles 6–12 mm long, glabrous. Inflorescence a many-flowered, open to distant-flowered, upper-axillary or terminal spike; flowers in triads, rachis glabrous or sometimes with few scattered hairs, glabrescent, usually growing out at anthesis (some not growing out at all); bracts (not seen) caducous early; bracteoles absent. Calyx tube campanulate to cylindrical, 1.5–2.7 mm long, glabrous; lobes semicircular 0.7–2 mm long, glabrous with hyaline margin. Petals white, obovate to nearly circular with a short broad claw, 2–4 mm long. Stamens white, glabrous; claw 2–4 mm long; filaments 5–10 attached to margin of each claw, free part to 12 mm long. Style 10–14 mm long, glabrous; stigma small to capitate. Ovary 2–3 mm long, pubescent above. Fruit cup-shaped or cylindrical, 4–5 mm long and wide, orifice 3–4 mm diam., calyx lobes absent; in an open spike.

Northern Australia from Kimberley region, Western Australia to Shoalwater Bay, Queensland; also Malesia and New Caledonia; commonly cultivated.

**Specimens examined.** Northern Territory. 13° 03'S, 131° 70'E, Mar 1978, *Henshall* 1943 (BRI); Angurugu R., Groote Eylandt, Apr 1974, *Levitt* 370 (BRI). Queensland. COOK DISTRICT: Lankelly Ck, Oct 1969, *Webb & Tracey* 9681 (BRI). LEICHHARDT DISTRICT: Bombandy, 40 miles [64 km] S of Nebo township, Sep 1961, *Lazarides & Story* 141 (BRI).

*Melaleuca leucandendra* is a variable species in habit and leaf size. Trees growing in permanently moist situations commonly have leaves 25–40 mm wide and 150–200 mm long. The type of the species as described by Rumphius and the specimen in the Linnean Herbarium No. 941.2 are both of this form. Another form usually with narrower and shorter leaves is commonly found in Australia. F.M. Bailey (1883) believed it to be a distinct variety and described it under the name *M. leucadendron* var. *saligna* with a specimen from Endeavour River as the type. From his treatment, it appears that this form is what S.T. Blake regarded as typical for the species. Both the wide-leaved and narrow-leaved forms are found in the same areas in Northern Australia, usually in different ecological situations. There are many examples of intermediate forms, so on present knowledge the 'var. *saligna*' of Bailey cannot be maintained.

Because of the variability of *M. leucadendra* and related species and a general similarity of all the species within the group, considerable confusion in the naming of specimens has resulted. If careful examination is made of indumentum, number and length of stamens, and leaf shape and thickness most problems can be resolved.

The combination of relatively thinner leaves, wider below the middle and open, almost totally glabrous, inflorescences distinguishes *M. leucadendra* from related species.

**39. *Melaleuca viridiflora*** Sol. ex Gaertn., *Fruct. et Semin.* 1:173, t. 35 (1788); Blake, *Cont. Qd Herb.* 1:28–41 (1968) including *M. quinquenervia* (Cav.) S.T. Blake. **Types:** Queensland. Endeavour River, Jul–Aug 1770, *Banks & Solander* (BM, NSW, MEL, W).

Synonyms: see Blake (*loc. cit.*).

Shrub or tree to 25 m high. Bark layered, papery and fibrous, loose to tight and hard. Branchlets usually sericeous, sometimes glabrous. Leaves scattered, flat, narrowly to broadly obovate, sometimes elliptical or broadly ovate, acute to obtuse, sometimes apiculate, narrowly attenuate at the base, 50–220 mm long, 6–70 mm wide, sericeous, hairs persistent or glabrescent, sometimes glabrous, 5- or more-veined, oil glands usually obscure; petioles 4–20 mm long, usually with some indumentum. Inflorescence a many-flowered, dense to moderately open, upper-axillary or terminal spike, often 2–4 together; flowers in triads; rachis glabrous to pubescent, growing out after anthesis; bracts broadly ovate, to 7 mm long, glabrous, striate; bracteoles absent. Calyx tube cup-shaped, 2–3.5 mm long, 1.7–3 mm wide, glabrous or pubescent; lobes semicircular, 1–2 mm long, glabrous or pubescent with hyaline margins. Petals white or red, obovate, with short claw 2–5 mm long. Stamens white, yellow, green, pink or red, glabrous; claw 0.5–4 mm long (sometimes split to base giving apparently more bundles); filaments 4–10 attached to margin of each claw; free part 14–20 mm long. Style 17–24 mm long, glabrous; stigma small. Ovary 1.5–2.5 mm long, pubescent above. Fruit shortly barrel-shaped, 2.5–5 mm long, 4–6 mm wide, orifice 2.5–4 mm diam., calyx lobes deciduous; in an open or dense spike.

Northern and eastern Australia, widespread from Kimberley region, Western Australia to Sydney; also New Guinea and New Caledonia.

This species demonstrates a high degree of variability. Within the species a number of populations can be distinguished, at least at the flowering stage, but intermediate forms can be found. Because of the presence of these forms, the variation within the species, and the variation occurring with growth, varietal status for the distinguishable populations is a more practical approach than recognising them as separate species.

Distinguishing *M. viridiflora* from related species and the recognition of possible infraspecific taxa has been a problem and the species has been considered difficult to diagnose. Blake's 1968 taxonomic classification of the group, for the most part, is followed here. However, for the species *M. viridiflora* and *M. quinquenervia* there is an overlap in all ranges of measurements given for key characters by Blake. Considerable difficulty has been experienced in trying to place some herbarium material as *M. viridiflora* or *M. quinquenervia*. The same problem is experienced by field workers trying to identify plants in areas where the species overlap. Consequently *M. quinquenervia* is here treated as conspecific with *M. viridiflora* but maintained as a variety.

**Melaleuca viridiflora** var. **viridiflora** is widespread in Northern Australia and New Guinea. Within the variety a wide range of flower colour and habit is found but it can be distinguished by the characters given in the key.

**Selected specimens.** Northern Territory. Near Banka Banka Station, 18°52'S, 134°3'E, Jun 1946, *Blake* 16016 (BRI); Sir Edward Pellew Group, 15°44'S, 136°37'E, Feb 1976, *Craven* (BRI). Queensland. BURKE DISTRICT: 3 miles [5 km] E of Normanton, Mar 1954, *Lazarides* 4280 (BRI). PORT CURTIS DISTRICT: 4 miles [6 km] from Yeppon towards Byfield, May 1970, *Telford* 1711 (BRI).

**Melaleuca viridiflora** var. **canescens** Byrnes, *Austrobaileya* 2: 74 (1984). **Type:** Queensland. Cook District: 30 miles [48 km] SSE of Strathleven homestead, Nov 1965, *Pedley* 1843 (BRI, holo).

This variety usually has a gnarled habit and distinctive canescent leaves with persistent appressed sericeous indumentum.

The leaves are wide and a number of colour forms have been collected. It is found in drier areas of northern Queensland.

**Selected specimens.** Queensland. COOK DISTRICT: Wrotham Park, Apr 1983, *Blake* 13710 & 13711 (BRI); 6 miles [10 km] NE of Strathmore Station, Aug 1953, *Perry* 3921 9 (BRI); 18°15'S, 141°00'E, May 1966, *Moore* 44 (BRI).

**Melaleuca viridiflora** var. **glabra** (C. White) Byrnes, *Austrobaileya* 2: 74 (1984). Based on *M. cunninghamii* var. *glabra* C. White. **Type:** Papua New Guinea. Tarara, *Brass* 8485 (BRI).

Blake referred *M. cunninghamii* var. *glabra* to *M. quinquenervia* but the type has the typical wide leaves of *M. viridiflora* var. *viridiflora* from which it differs in being glabrous in all parts, except for the very young buds.

Eastern Queensland north of Rockhampton; also Papua New Guinea.

**Specimens examined.** Queensland. COOK DISTRICT: Outside Port Douglas, Jul 1967, *Moriarty* 7 (BRI); Cumberland, Gilbert R., May 1937, *Brass* 8809 (BRI); 12°48'S, 143°03'E, Jul 1968, *Pedley* 2753 (BRI). PORT CURTIS DISTRICT: Nine Mile Beach, 22°52'S, 150°47'E, Jul 1977, *Batianoff & McDonald* 452 (BRI).

**Melaleuca viridiflora** var. **attenuata** Byrnes, *Austrobaileya* 2: 74 (1984). **Type:** Cook District: outside Port Douglas, ca 7 miles [11 km] ESE of Mossman, July 1967, *Moriarty* 9 (BRI, holo).

A narrow-leaved variety with glabrous or early glabrescent inflorescences. Leaves exceeding 100 mm long but less than 20 mm wide are common.

Queensland, mainly Cape York Peninsula.

**Specimens examined.** Queensland. COOK DISTRICT: between Cook Hwy & Port Douglas, Jul 1962, *Tracey & Webb* 6433 (BRI); Dimbulah, Jun 1929, *Tardent* (BRI); Dimbulah area, Dec 1955, *White* 1263 (BRI); Stannary Hills, *Bancroft* (BRI); near Chillagoe, Apr 1938, *Blake* 13565 (BRI); Frewhurst, Feb 1922, *White* 1369 (BRI); Yaramulla Stn, Apr 1980, *Williams* 80048 (BRI).

**Melaleuca viridiflora** var. **rubriflora** Brong. & Gris, Bull. Soc. Bot. France 11: 183 (1864).

Type: New Caledonia, near Balade, *Vieillard* (P).

*M. quinquenervia* (Cav.) S.T. Blake, Contrib. Qd Herb. 1:28 (1968). Based on *Metrosideros quinquenervia* Cav., Ic. Pl. 4: 19, t. 333 (1779). Type: Port Jackson, Apr 1793, *Nee* (MA, lost, see Blake, *loc. cit.*).

*M. viridiflora* var. *angustifolia* (L.f.) Byrnes, *Austrobaileya* 2:74 (1984), nom. illeg. non Bl., *Bijdr.* 1099 (1826). Based on *Melaleuca leucodendra* var. *angustifolia* L.f., *Suppl. Pl.* 342 (1781). Type: New Caledonia, *Forster* (LINN, holo, *n.v.*; BRI, microfiche).

S.T. Blake considered this to be a species distinct from *M. viridiflora* and related species and made the combination *M. quinquenervia* (Cav.) S.T. Blake based on *Metrosideros quinquenervia* Cav. The variety is not as distinct as some other varieties of *M. viridiflora* but is considered to be worthy of varietal status. It can usually be distinguished from other varieties by its thinner and shorter leaves and shorter stamens.

Widespread in eastern coastal Australia north of Sydney; also in New Guinea and New Caledonia.

**Selected specimens.** Queensland. COOK DISTRICT: Summit of Mt Tozer, Jul 1948, *Brass* 19477 (BRI). PORT CURTIS DISTRICT: Curtis Island, Mar 1966, *Blake* 22582 (BRI). WIDE BAY DISTRICT: Fraser Island, May 1919, *Peirre* (BRI). MORETON DISTRICT: Bulimba, Brisbane, Apr 1963, *Henderson* H5 (BRI).

**40. Melaleuca bracteata** F. Muell., *Fragm.* 1:15 (1885); Blake, *Cont. Qd Herb.* 1:65 (1968); Carrick & Chorney, *J. Adelaide Bot. Gard.* 1:286 (1979). Type: Moreton Bay, *W. Hill* (MEL, lecto, chosen by Blake).

Synonyms: see Blake. (*loc. cit.*)

Shrub or tree to 15 m high. Bark grey to black, fissured, hard. Branchlets densely pubescent, hairs glabrescent or persistent, rarely glabrous. Leaves scattered, flat or concave above, sometimes twisted, narrowly ovate to ovate, acute to acuminate, 5–28 mm long, 1–3 mm wide, veins (3–) 5–11, usually visible with lens in thinner leaves, pubescent, persistent or soon glabrescent, rarely glabrous, oil glands usually visible with lens in thinner leaves; petioles absent. Inflorescence a few- to many-flowered, dense or open, upper axillary, terminal or subterminal spike; flowers single or in triads; rachis pubescent, growing out about anthesis; bracts leaf-like but usually shorter and broader; bracteoles ovate, apiculate, to 2 mm long, pubescent, deciduous. Calyx tube hemispherical, cup-shaped, or globose-urceolate, 1–2 mm long and wide, pubescent, sometimes faintly ribbed; lobes ovate or triangular, sometimes shortly acuminate, 0.5–1.7 mm long, usually with 1–3 ribs, pubescent or glabrous. Petals white, nearly circular, without claws, 1.5–2 mm long, deciduous. Stamens white, glabrous; claw 3–4 mm long; filaments 16–25, attached to upper margin of each claw commonly in two series, free part to 5 mm long. Style 7–8 mm long, glabrous; stigma small. Ovary *ca* 1 mm long, pubescent above. Fruit cup-shaped, 2–2.5 mm long excluding persistent calyx lobes, 2.5–3 mm wide, orifice 2–2.5 mm diam.; in open or dense spikes.

Widespread species found in the Northern Territory, Queensland, northern New South Wales, South Australia and Western Australia.

**Selected specimens.** Northern Territory. Victoria River Downs, Sep 1969, *Everist* 9273 (BRI). Queensland. NORTH KENNEDY DISTRICT: 5 miles [8 km] West of Hervey Ra., Nov 1980, *Hawkeswood* 598 (BRI). LEICHHARDT DISTRICT: Minerva, Springsure, Jul 1934, *Blake* 7021 (BRI). New South Wales. Unumgar State Forest, Nov 1952, *Constable* (BRI).

*M. bracteata* displays a wide range of variation mainly in the leaves. The eastern coastal specimens have glabrescent, or sometimes glabrous, large, thin leaves which usually have more than seven veins and oil glands visible with a lens. Specimens from Central Australia have smaller thicker leaves with fewer obscured veins, more persistent indumentum and oil glands visible with lens. Between these extremes there is a wide range of intermediate forms which makes it impossible to recognise infraspecific taxa.

**41. Melaleuca styphelioides** Smith, *Trans. Linn. Soc. Lond.* 3:275 (1797). Type: Port Jackson, *D. Burton* (LINN, *n.v.*).

Shrub or small tree, rarely to 20 m high. Bark layered, papery or hard and scaly. Branchlets pubescent. Leaves scattered, sessile, flat, often twisted or concave above, ovate

to broadly ovate, acute, tapered to pungent point, cuneate at base, 4–25 mm long, 2–6 mm wide, 15–30-veined, puberulous or at least ciliate on margins, glabrescent early, oil glands visible with lens. Inflorescence a few- to many-flowered, dense, some-times leafy, upper-axillary, terminal or subterminal spike; flowers in triads, sometimes single; rachis tomentose, growing out before anthesis; bracts leaf-like but deciduous; bracteoles ovate, subulate, to 3 mm long, pubescent, deciduous. Calyx tube ovoid, rarely urceolate, pubescent or sometimes glabrous, 1.5–2.5 mm long, *ca* 2 mm diam., ribbed; lobes triangular, acuminate, 1.5–2 mm long, conspicuously veined, pubescent or glabrous. Petals white, nearly circular, shortly clawed, 1–2 mm long, deciduous before anthesis. Stamens white, glabrous; claw 3–4 mm long; filaments 12–26, attached to margin of upper third of each claw, free part to 6 mm long. Style 7–11 mm long, glabrous; stigma small. Ovary to 2 mm long, pubescent above. Fruit cup-shaped to ovoid 2–3.5 mm long excluding the semi-persistent calyx lobes, 2–3 mm wide, orifice *ca* 1.5 mm diam.; in open or dense spikes.

Eastern Australia, coastal areas and adjoining ranges from Mary River, southern Queensland to Shoalhaven River, New South Wales.

**Melaleuca styphelioides** var. **styphelioides**

Selected specimens. Queensland. MORETON DISTRICT: 1.5 miles [2 km] N of Caloundra, Nov 1969, *Lebler* (BRI). New South Wales. 5 miles [8 km] E of Raymond Terrace, Apr 1960, *Story* 7261 (BRI); Gosford, Nov 1952, *J. King* (BRI); Kanimbla Valley, Blackheath, Nov 1948, *Constable* (BRI).

**Melaleuca styphelioides** var. **squamophloia** Byrnes, *Austrobaileya* 2: 74 (1984). **Type:** Darling Downs District: Kogan, Dec 1949, *K.R. Kerr* (BRI, holo; CANB, NSW, iso).

This variety in many respects is intermediate between *M. styphelioides* var. *styphelioides* and *M. bracteata* and may be a hybrid. It has the smaller calyx lobes and more numerous stamens of the latter, an intermediate bark, but the clawed petals and more numerous leaf veins of *M. styphelioides*. It grows on the black soil plains usually in wetter areas chiefly of the Darling Downs District.

Specimens examined. Queensland. DARLING DOWNS DISTRICT: 19 miles [30 km] E of Meandarra, Dec 1958, *Walter* (BRI); 3 miles [5 km] E of Jandowae, Nov 1969, *Nielsen* (BRI); 3 km W of The Gums, Nov 1971, *Stevenson* (BRI) & Sep 1980, *Byrnes* 3957 (BRI); between Meandarra & Condamine, Nov 1962, *Everist* 7231 (BRI); 4 miles [6 km] S of Rywung, Apr 1971, *Williams* (BRI); Dogwood Creek, E of Gurulmundi & N of Miles, Nov 1930, *Belson* (BRI); 2 miles [3.2 km] N of Ehlma, May 1958, *Johnson* 482 (BRI). BURNETT DISTRICT: Kingaroy, May 1952, *Benham* (BRI).

**42. Melaleuca viminalis** (Sol. ex Gaertner) Byrnes, *Austrobaileya* 2: 75 (1984). *Callistemon viminalis* (Sol. ex Gaertner) G. Don ex Loudon, Hort. Brit. 197 (1830). Based on *Metrosideros viminalis* Sol. ex Gaertner, Fruct. et Semin. 1: 171, t. 34, f. 4. (1788). **Type:** Endeavour River, *Solander* (K, n.v.).

*Callistemon speciosus* auct. non DC.; Bailey, Qd Flora 2: 594 (1900).

Shrub or small tree to 10 m high. Bark dark, rough, furrowed. Branchlets villous or glabrous, usually pendulous. Leaves scattered, flat, elliptical to narrowly elliptical, acute, apiculate, cuneate or narrowly attenuate at base, 35–105 mm long, 5–30 mm wide, glabrous or villous, usually glabrescent, 3-veined, veins usually visible, oil glands visible with lens; petioles 1–8 mm long. Inflorescence a many-flowered, dense to open, terminal spike; flowers single within each bract; rachis villous or glabrous, growing out usually after anthesis; bracts broadly ovate, apiculate, 7–8 mm long, multiveined, pubescent, caducous; bracteoles absent. Calyx tube cylindrical, 3–4 mm long, glabrous to densely villous; lobes semicircular to truncate elliptical, 1–2 mm long, glabrous or villous, margins hyaline, ciliate. Petals pink to red, obovate to nearly circular, with or without short broad claw, 4–5 mm long. Stamens red, glabrous; claw 0.5–3 mm long or sometimes fused to form a ring; filaments 6–11 on margin of each claw, free part to 24 mm long. Style to 26 mm long, glabrous; stigma capitate. Ovary 1–2 mm long, pubescent above. Fruit cup-shaped, 5–6 mm long, 4–5 mm wide, orifice 3–4 mm diam., calyx lobes deciduous; in open spike.

Eastern Australia along coast and ranges, rarely inland, from Cape York, Queensland to Clarence River, New South Wales. Commonly cultivated.

**Melaleuca viminalis** var. **viminalis** is generally larger in all parts and has fewer hairs than *M. viminalis* var. *minor*. It has longer claws, often 2–3 mm long as in the type (pers. comm. M.D. Crisp) and is found in the northern part of the species' range of distribution.

**Selected specimens. Queensland.** COOK DISTRICT: Chester R., Sep 1973, *Hyland* 6836 (BRI); Mowbray R., Jan 1932, *Brass* 1930 (BRI). NORTH KENNEDY DISTRICT: Hinchinbrook Is., Aug 1975, *Sharpe* 1639 (BRI). PORT CURTIS DISTRICT: Marlborough Ck, Jul 1962, *Trapnell & Williams* 211 (BRI).

**Melaleuca viminalis** var. **minor** Byrnes, *Austrobaileya* 2: 75 (1984). **Type:** Moreton District: Albert River, S of Brisbane, Aug 1930, *Hubbard* 3828 (BRI, holo).

In this variety the stamens may be united in a ring with little indication of the claw. Other structures are generally smaller and more persistently villous than found in the variety represented by the type of the species.

**Selected specimens. Queensland.** BURKE DISTRICT: Hughenden, Sep 1925, *Longman* (BRI). DARLING DOWNS DISTRICT: 9.6 km 9°E of N of Pittsworth, Jan 1975, *Stanley* 72 (BRI). New South Wales. Clarence R., Sep 1916, *Cheel* (BRI).

Intermediates between the varieties can be found but the two populations represented by the varieties are, for the most part, distinct.

The species is quite variable in habit, length of flower spike and density and persistence of indumentum. Many of the forms are genetically controlled and have been selected for horticultural purposes.

Although *Metrosideros viminalis* was described from Australian material in 1788 it was not mentioned by Bentham in *Flora Australiensis*. It was placed in *Callistemon* by both G. Don and Cheel but here is placed in *Melaleuca* on the criterion of having staminal bundles, particularly in the northern populations which the type represents.

**43. Melaleuca arcana** S.T. Blake, *Cont. Qd Herb.* 1: 54 (1968). **Type:** Cook District: NW of Cooktown and W of Cape Bedford, Feb 1958, *Blake* 20260 (BRI, holo).

*M. leucadendra* f. *ruscifolia* Cheel in Ewart & Davies, *Fl. N. Terr.* 302 (1917). **Type:** [Queensland, Point Lookout] *Banks & Solander* (NSW, holo).

Shrub or tree to 10 m high. Bark layered, papery. Branchlets sericeous, glabrescent. Leaves scattered, flat, broadly to narrowly obovate or elliptical, obtuse or acute, shortly attenuated at base, 18–50 mm long, 8–20 mm wide; sericeous, glabrescent early, 5–7-veined, oil glands obscure; petioles 0.5–3 mm long, sericeous. Inflorescence a many-flowered dense, short, terminal spike; flowers in triads (obscured by density); rachis villous (obscure), growing out after anthesis; bracts broadly ovate, to 4 mm long, multiveined, deciduous; bracteoles absent. Calyx tube turbinate, usually angular, ca 2 mm long, indumentum in patches; lobes ovate, 1–1.5 mm long, margins ciliate. Petals white, obovate, with or without short broad claw, 1.7–2.5 mm long. Stamens white, glabrous; claw 0.2–1.4 mm long (sometimes divided to base); filaments 5–9, unevenly united to margin of each claw, free part to 12 mm long. Style 9–10 mm long, glabrous; stigma small. Ovary ca 1 mm long, pubescent above. Fruit turbinate, angular, 3–5 mm long and wide, orifice 1.5–3 mm diam., calyx lobes deciduous; in a dense head or short spike.

North-eastern Australia in coastal areas of Cape York Peninsula, north Queensland.

**Selected specimens. Queensland.** COOK DISTRICT: Between McIvor R. & Cape Flattery, Nov 1972, *Dockrill* 618 (BRI); 15°12'S, 145°06'E, Aug 1969, *Bates* (BRI); ca 24 km SW of Cape Melville, Jul 1972, *Stanton* 21 (BRI); Newcastle Bay, 2.5 miles [4 km] S of Somerset, May 1948, *Brass* 18651 (BRI).

**44. Melaleuca saligna** Schauer in Walpers, *Rep. Bot. Syst.* 2: 927 (1843); Blake, *Cont. Qd Herb.* 1: 52 (1968). **Type:** Queensland, Endeavour R., in 1819, *A. Cunningham* 256 (BM, iso).

Tree to 10 m high, bark layered, papery. Branchlets thinly pilose, glabrescent, pendulous. Leaves scattered, flat, narrowly obovate, acute, cuneate at base, 30–105 mm long, 4–18 mm wide, thinly pilose, glabrescent early, 3–7-veined, often indistinct, oil glands obscure; petioles 2–8 mm long, usually pilose. Inflorescence a many-flowered, dense, axillary and terminal, globose or ellipsoid head, rarely a spike, sometimes succeeding heads confluent; flowers in triads; rachis densely villous growing out at anthesis; bracts ovate or pentagonal, ca 2 mm long, pubescent, multiveined, semipersistent; bracteoles absent. Calyx tube

turbinate to campanulate, often angular, 1–1.5 mm long, pubescent; lobes triangular to broadly ovate with narrow margin 0.5–0.8 mm long, pubescent. Petals white, obovate to nearly circular, shortly clawed, 1.5–2 mm long. Stamens white, glabrous; claw variable in size, 0.5–2.5 mm long, sometimes divided to base; filaments 6–9 attached to margin of each claw, free part to 8 mm long. Style 7–9 mm long, glabrous; stigma small. Ovary to 1 mm long, pubescent above. Fruit cylindrical, 2.5 mm long and wide, orifice 2 mm diam., calyx lobes deciduous; in heads or short dense spikes.

Northern Australia from Torres Strait Islands to near Cooktown, Queensland.

**Selected specimens.** Queensland. COOK DISTRICT: Portland Roads, Jun 1948, *Brass* 18978 (BRI); 14°20'S, 144°20'E, Sep 1970, *Hyland* 4618 (BRI); Cooktown, May 1962, *Blake* 21799 (BRI); between Forsyth & Einsleigh, Feb 1980, *Mitchell* 1 (BRI).

Specimens with confluent inflorescences may key as *M. stenostachya* but usually *M. saligna* can be distinguished by its dense heads borne both terminally and in the axils. *M. stenostachya* has dense or open spikes borne either terminally or only in the upper axils.

- 45. *Melaleuca groveana*** Cheel & C. White, Proc. Roy. Soc. Qd 36, 5: 41 f. 1 (1925); Blake, Cont. Qd Herb. 1: 59 (1968). **Type:** Queensland, near Edenvale Railway Station, *Grove* 132 (NSW, BRI).

Shrub or small tree to 10 m high. Bark layered, papery and fibrous, becoming hard. Branchlets puberulous, glabrescent early. Leaves scattered, flat, narrowly elliptical, acute, usually apiculate, attenuate or cuneate at base, 10–55 mm long, 3–7 mm wide, puberulous, soon glabrescent, 3(–5)-veined, at least midvein visible, oil glands commonly visible on undersurface; petioles 1.5–3 mm long, glabrescent. Inflorescence a few- to many-flowered, usually open terminal spike; flowers single within each bract; rachis glabrous or puberulous, growing out after anthesis; bracts not seen, caducous; bracteoles nearly circular, ca 0.5 mm diam., puberulous with ciliate margins, deciduous. Calyx tube campanulate, 3–4.5 mm long, glabrous; lobes broadly ovate, with hyaline ciliate margins, 1–1.5 mm long. Petals white, broadly ovate, with or without short broad claw, to 4 mm long. Stamens white, glabrous; claw 1–3 mm long; filaments 11–26 attached to margin and sometimes upper surface of each claw, free part to 10 mm long. Style 10–12 mm long, glabrous; stigma capitate. Ovary ca 2 mm long, pubescent above. Fruit barrel-shaped or truncate-ovoid, 4–7 mm long and wide, orifice 2–3 mm diam., calyx lobes absent; in an open spike.

Eastern Australia on central and coastal highlands from central Queensland to North Coast, New South Wales.

**Selected specimens.** Queensland. LEICHHARDT DISTRICT: 23°45'S, 149°05'E, Sep 1964, *Gittins* 941 (BRI). BURNETT DISTRICT: near Kingaroy, Edenvale, Sep 1954, *Blake* 19703 (BRI). MORETON DISTRICT: Mt Beerwah, Sep 1957, *McGillivray* 290 (BRI). New South Wales. South Brother Mt, Johns River, Feb 1926, *Cheel* (NSW, BRI).

- 46. *Melaleuca deanei*** F. Muell., Proc. Linn. Soc. N.S.W. ser II, 1: 1106 (1887); Blake, Cont. Qd Herb. 1: 56 (1968). **Type:** New South Wales: Lane Cove R., *Deane* (MEL, holo; NSW, iso).

Synonyms: see Blake (*loc. cit.*).

Shrub to 3 m high. Bark rough, fissured. Branchlets puberulous soon glabrescent. Leaves scattered, flat, narrowly elliptical to narrowly obovate, acute, apiculate, narrowly attenuated at base, 10–25 mm long, 3–7 mm wide, glabrous or thinly pilose, soon glabrescent, 3- sometimes 5-veined, midvein at least visible, oil glands visible or obscure; petioles 0.8–2.2 mm long, glabrescent. Inflorescence a many-flowered, open, terminal or upper axillary spike; flowers single within each bract; rachis villous, growing out after anthesis; bracts elliptical, to 5 mm long, densely villous, caducous; bracteoles nearly circular, ca 0.5 mm long, villous, caducous. Calyx tube turbinate to campanulate, 4–5 mm long, villous; lobes broadly ovate to semicircular, without hyaline margins, 1.3–2 mm long, villous. Petals broadly ovate to circular with short claw, 3–5 mm long, sericeous outside. Stamens white, glabrous or puberulous towards base; claw 1.5–2 mm long; filaments 17–28 attached to margin or few on inner surface of each claw, free part to 10 mm long. Style 11–14 mm long, glabrous or with few scattered hairs towards base; stigma capitate to peltate. Ovary to 4 mm long, velutinous above. Fruit barrel-shaped or subcylindrical,

7–8 mm long, 5.5–7 mm wide, orifice 3 mm diam., calyx lobes deciduous; in open spikes.

Eastern Australia from Sydney to Nowra, New South Wales.

**Selected specimens.** New South Wales. Cooks R., Oct 1901, *Hamilton* (BRI); Waterfall, 21 miles [34 km] S of Sydney, Nov 1952, *King* (BRI); Arncliffe, Oct 1897, *Camfield* (NSW, BRI); Hornsby, Oct 1918, *Blakely* (NSW).

**47. *Melaleuca sieberi*** Schauer in Walpers, Rep. Bot. Sys. 2: 928(1843); Blake, Cont. Qd Herb. 1: 60 (1968). **Type:** near Sydney, *Sieber* 601 (MO, iso, photo BRI).

*M. parviflora* Lindley var. *latifolia* Maiden & Betche, Census N.S.W. Pl. 155–56 (1916). **Type:** Wardell, Jun 1884, *Betche* (NSW, lecto selected by Blake).

Shrub or small tree to 20 m high. Bark layered, papery. Branchlets glabrous or crisped pubescent, glabrescent. Leaves scattered, flat, narrowly elliptical to narrowly ovate, acute, often apiculate, cuneate at base, 4–15 mm long, 1–4 mm wide, glabrous or pubescent, glabrescent early, 3-veined usually obscure or only mid-vein visible, oil glands visible with lens; petioles to 1 mm long, glabrescent. Inflorescence a few- to many-flowered, upper axillary or terminal spike; flowers single within each bract or rarely in triads; rachis densely pubescent, growing out after anthesis; bracts narrowly to broadly ovate, 2–3 mm long, pubescent or puberulous, deciduous; bracteoles absent. Calyx tube campanulate to cylindrical, 2–3 mm long and wide, pubescent; lobes ovate to triangular, 1–1.5 mm long, pubescent to glabrous, without hyaline margins. Petals often pink in part, nearly circular with a short claw, 2–3 mm long. Stamens white, glabrous; claw 2–3 mm long; filaments 11–25 attached to margin of upper half of each claw, free part to 6 mm long. Style 8–10 mm long, glabrous; stigma capitate. Ovary *ca* 2 mm long, pubescent above. Fruit barrel-shaped to cup-shaped, 3–5 mm long and wide, orifice 2–3 mm wide, calyx lobes semipersistent; in an open spike.

Eastern coastal areas from Wide Bay, Queensland to Sydney area, New South Wales.

**Selected specimens.** Queensland. MORETON DISTRICT: 26°25'S, 153°02'E, Oct 1968, *Baxter & Lebler* 1107 (BRI); off Fredrick Street, Bribie Island, Sep 1973, *Bates* 516 (BRI); Albert R., near Plunkett, Sep 1930, *Curtis* 4027 (BRI). New South Wales. CENTRAL COAST: Gosford, Oct 1952, *King* (BRI).

**48. *Melaleuca kunzeoides*** Byrnes, *Austrobaileya* 2: 75 (1984). **Type:** Warrego District: near Bat Cave, Milo Holding, *ca* 20 km NW of Adavale, 13 Apr 1981, *Sandercoe* s.n. (BRI, holo; CANB, K, NSW, iso).

Shrub 1–2 m high. Bark layered, papery to hard. Branchlets glabrous, glandular. Leaves scattered, flat or slightly concave above, narrowly ovate to rectangular, acute to obtuse, shortly apiculate, shortly attenuate at base, 4–8 mm long, 1–2 mm wide, glabrous or thinly puberulous, glabrescent, 1–3-veined obscure, oil glands visible with lens; petioles *ca* 0.5 mm long. Inflorescence a few- to many-flowered, dense usually leafy terminal short raceme; flowers single or in pairs on very short pedicels; rachis glabrous, growing out after anthesis; bracts leaf-like; bracteoles subulate, 1–2 mm long, glabrous. Calyx tube campanulate, 1–1.5 mm long and wide, glabrous; lobes triangular, 1–1.5 mm long, glabrous, sometimes partly fused in pairs. Petals white, elliptical, clawed, 1.5–2 mm long. Stamens yellow-green, glabrous; claw 2.5–3.5 mm long; filaments 4–6 attached to the upper margin of each claw; free part to 4 mm long. Style 4–5 mm long, glabrous; stigma small. Ovary *ca* 1 mm long, puberulous above. Fruit hemispherical to globular with persistent calyx lobes, *ca* 3 mm long, 2 mm wide, orifice *ca* 1.5 mm diam., thin walled; in a short raceme, deciduous at maturity.

South-western Queensland.

**Specimens examined.** Queensland. WARREGO DISTRICT: near Bat Cave, Milo Holding, *ca* 20 km NW of Adavale, May 1979, *Sandercoe* 122 (BRI) & Nov 1981, *Sandercoe* 2004 (BRI).

This species is known only from the type locality but probably has been overlooked in other areas as the flowers are not easily seen. It exhibits characters of *Kunzea* and *Melaleuca* and is placed in the latter genus on the basis of the fusion of the lower filaments into a claw.

**49. *Melaleuca armillaris*** (Sol. ex Gaertner) Smith, Trans. Linn. Soc. Lond. 3: 227 (1797); Benthams, Fl. Austr. 3: 146 (1867). Based on *Metrosideros armillaris* Sol. ex Gaertner, Fruct. et Semin. Pl. 1: 171 t. 34 f. 5 (1788). **Type:** *Solander* (NSW, iso).

*M. ericaefolia* Andr., Bot. Rep. 3: t. 175 (1801).

Shrub to 5 m high. Bark layered, hard, fissured. Branchlets glabrous or pubescent, glabrescent early. Leaves scattered, flat or concave above, linear, acute, apiculate, recurved towards apex, narrowly cuneate at base, 12–25 mm long, to 1 m wide, glabrous or puberulous, soon glabrescent, 1–3-veined obscure, oil glands visible with lens; petioles 1–2 mm long, glabrous. Inflorescence a many-flowered, dense spike on a short lower axillary branchlet; flowers single within each bract; rachis minutely puberulous to woolly, growing out before anthesis; bracts ovate-acuminate, to 14 mm long, deciduous; bracteoles absent. Calyx tube cylindrical, laterally compressed at base, longitudinally attached, 1–1.5 mm long, glabrous, lobes broadly triangular, *ca* 1 mm long with lateral hyaline margins, glabrous. Petals white, ovate, clawed, 2–3 mm long. Stamens white, glabrous; claw 5–6 mm long; filaments 16–18 attached to margin and upper surface of top third of each claw, free part to 4 mm long. Style 8–10 mm long, glabrous; stigma capitate. Ovary 1–1.5 mm long, pubescent above. Fruit shortly cylindrical, 3–5 mm long and wide, orifice 2–4 mm diam.; calyx lobes semipersistent, incurved; in a dense spike.

From Manning River to Two Fold Bay, New South Wales, coast and adjacent ranges. Commonly cultivated.

**Selected specimens.** New South Wales. Cronulla, Oct 1952, *King* (BRI); 4 miles [6 km] W of Green Cape, Oct 1954, *Constable* (BRI); South Head, Jan 1899, *Boorman* (BRI).

- 50. *Melaleuca alternifolia*** (Maiden & Betche) Cheel, Proc. Roy. Soc. N.S.W. 58: 195 (1924); based on *M. linariifolia* var. *alternifolia* Maiden & Betche, Proc. Linn. Soc. N.S.W. 29: 742 (1905). **Type:** New South Wales: Coffs Harbour to Grafton, Nov 1903, *J.H. Maiden & J.L. Boorman* (NSW, holo).

Shrub to 7 m high. Bark layered, papery. Branchlets puberulous, soon glabrescent. Leaves variously arranged, scattered to whorled often on one branchlet, flat or concave above, linear, acute, narrowly cuneate at base, 10–35 mm long, usually less than 1 mm wide, puberulous, soon glabrescent, 3-veined, usually only midvein visible, oil glands visible with lens; petioles *ca* 1 mm long. Inflorescence a many-flowered, open to dense, upper-axillary or terminal spike; flowers solitary within each bract; rachis puberulous, growing out at anthesis; bracts linear to ovate, *ca* 2 mm long, caducous; bracteoles ovate, caducous. Calyx tube cup-shaped, 1.5–2 mm long, glabrous; lobes triangular to ovate with narrow thin margin, *ca* 1 mm long, glabrous. Petals white, broadly elliptical with a short narrow claw, 2–3 mm long. Stamens white, glabrous; claw 6–12 mm long; filaments 30–60 attached to margins and upper surface for most of the length of each claw; free part to 4 mm long. Style 3–4 mm long, glabrous; stigma capitate. Ovary 1.5–2 mm long, pubescent above. Fruit cup-shaped, 2–3 mm long and wide, orifice 1.5–2.5 mm diam., calyx lobes usually fallen by maturity; in an open spike.

Along coast and adjacent ranges from Darling Downs, Queensland to Hunter River, New South Wales.

**Selected specimens.** Queensland. DARLING DOWNS DISTRICT: Messines via Cottonvale, Nov 1930, *Greener* (BRI); Wyberba, Jan 1933, *Blake* 4599 (BRI). New South Wales. O.B.X. Ck, Dalmorton to Grafton, Oct 1952, *Constable* (BRI, NSW).

This species is closely related to *M. linariifolia* but differs in its irregular leaf arrangement, shorter style and the bracts falling earlier. *M. alternifolia* has narrower leaves than *M. linariifolia* when populations of the two occur in the same area. It is a valuable oil producing species.

- 51. *Melaleuca decora*** (Salisb.) J. Britten, J. Bot 54: 62 (1916); Blake Cont. Qd Herb. 1: 67 (1968). Based on *Metrosideros decora* Salisb., Prod. 352 (1796). **Type:** New South Wales, near Port Jackson, *David Burton* (LINN, n.v.).

Synonyms: see Blake (*loc. cit.*).

Shrub or tree to 12 m high. Bark layered, papery and fibrous. Branchlets pubescent with short crisped hairs, glabrescent. Leaves scattered, flat or concave above, linear, oblong or narrowly elliptical, acute, cuneate or narrowly attenuate at base, 15–16 mm long, 1–2 mm wide, shortly pubescent, glabrescent early, 3-veined usually obscure; oil glands usually obscure; petioles to 1 mm long, glabrescent. Inflorescence a many-flowered, open, upper-axillary or terminal spike (sometimes leafy so flowers appear axillary); flowers single within each bract to triads; rachis shortly pubescent, growing out before anthesis;



bracts leaf-like or ovate-acute to 5 mm long, deciduous; bracteoles rarely present, minute. Calyx tube campanulate to urceolate or subcylindrical, 1.5–2.2 mm long, glabrous or puberulous, sometimes with ciliolate margins. Petals white, broadly ovate-elliptical with a long claw, 2–2.5 mm long, often reflexed. Stamens white, glabrous; claw 2–3.5 mm long; filaments 20–40 attached to margin and sometimes upper surface of each claw, free part to 3.5 mm long. Style 6–7 mm long, thinly pubescent; stigma small. Ovary 1–1.5 mm long, pubescent above. Fruitcup-shaped or truncate-ellipsoid, 2–3 mm long and wide, orifice 1–2.5 mm diam.; calyx lobes deciduous; in open spikes.

Coast and adjacent ranges from Burnett River, Queensland to Shoalhaven River, New South Wales.

**Selected specimens.** Queensland. BURNETT DISTRICT: 11 miles [18 km] from Cracow on Eidsvold Rd, Jul 1966, *Everist & McDonald* 4 (BRI). DARLING DOWNS DISTRICT: R. 16, Malcolm, N of Chinchilla, in 1958, *Cameron* 59/156 (BRI). MORETON DISTRICT: Salisbury, near Brisbane, Nov 1930, *White* 7175 (BRI). New South Wales. Chullora, Nov 1952, *King* (BRI).

**52. *Melaleuca linophylla*** F. Muell., *Fragm.* 3: 115 (1862); Benth., *Fl. Austr.* 3: 145 (1867); Carrick & Chorney, *J. Adelaide Bot. Gard.* 1(5): 291 (1979). **Type:** NW Australia, in 1861, *F. Gregory* (MEL).

Shrub to 4 m high. Bark layered, papery. Branchlets woolly, glabrescent. Leaves scattered, flat, narrowly elliptical, tapered to long acute apex, narrowly cuneate at base, 10–35 mm long, 1–3 mm wide, 3-veined, usually only midvein visible, woolly, soon glabrescent, oil glands visible with lens. Inflorescence a many-flowered very dense upper axillary or terminal spike; flowers solitary within each bract; rachis villous, growing out before anthesis; bracts linear, caducous (very early); bracteoles absent. Calyx tube turbinate to subcylindrical, *ca* 1 mm long, thinly pubescent; lobes triangular, *ca* 0.5 mm long, glabrous, without hyaline margin. Petals white to yellow, broadly elliptical with long narrow claw, 1.5 mm long. Stamens white to yellow, glabrous; claw 1–3 mm long; filaments 8–15 attached to margin and upper surface of each claw, free part to 1.5 mm long. Style to 2 mm long, glabrous; stigma capitate. Ovary to 0.7 mm long; pubescent above. Fruit campanulate or subcylindrical, to 2 mm long and wide, orifice 1.5 mm diam., calyx lobes semipersistent; in a dense spike.

Western Australia: Pilbara area.

**Selected specimens.** Western Australia. Strelley, E of Port Hedland, *Cleland* (PERTH); 5.5 miles [9 km] N of Bonnie Downs, Oct 1975, *Demarz* (PERTH); 21 km N of Marble Bar, Aug 1965, *Beauplehole* (PERTH); NW Australia, between Ashburton & de Gray Rivers, *Clement* (PERTH).

This species has been confused with *M. dissitiflora* in the past. Recent collections have shown the species to be distinct and distinguishable by its very small flowers and short style. Carrick & Chorney (*loc. cit.*) considered Mueller's description of the style as 1 line long (2 mm) an error.

**53. *Melaleuca diosmatifolia*** Dum.-Cours., *Bot. Cult.* ed. 2 5: 373 (1811). No type nominated.

*M. erubescens* Otto, *Pl. Rar. Hort. Berol* 37 in Nees, *Hor., Phys. Berol* (1820). *M. ericifolia* var. *erubescens* (Otto) Benth., *Fl. Austr.* 3: 159 (1867). No type nominated.

*M. fraseri* Hooker, *Bot. Mag.* 60: t. 3210 (1833).

Shrub to 2 m high. Bark hard, rough. Leaves scattered, terete at least at base, sometimes flattened towards apex, apiculate, narrowly attenuate at base, 5–11(–15) mm long, about 0.5 mm diam., glabrous, 3-veined, veins obscure; oil glands visible, often raised below; petioles *ca* 0.5 mm long. Inflorescence a many-flowered, open to dense spike on axillary branchlets; flowers single within each bract; rachis glabrous, growing out before anthesis; bracts and bracteoles absent. Calyx tube cylindrical to campanulate, 2 mm long, glabrous; lobes triangular to semicircular, herbaceous with thin margins, 0.5 mm long. Petals pink, ovate, with or without short claw, to 2 mm long. Stamens pink, glabrous, claw 3.5–6 mm long; filaments 15–30 attached in two rows to margin of upper third of each claw, free part to 4 mm long. Style 8–10 mm long; stigma small. Ovary to 1.5 mm long, pubescent above. Fruit shortly cylindrical or barrel-shaped, 3 mm long and 4 mm wide, orifice 2 mm diam., calyx lobes persistent becoming obscure; usually in dense spike.

From Darling Downs in Queensland to coast and ranges near Sydney and western slopes south to Temora in New South Wales.

**Selected specimens.** Queensland. DARLING DOWNS DISTRICT: 5 miles [8 km] W of Kogan, Nov 1956, *Bowles* (BRI). New South Wales. Barradine & Narrabri, Dec 1916, *Burrows* (BRI); Lane Cove R., *Fletcher* (BRI); Weddin Mtn, 6 miles [10 km] SSW of Grenfell, Mar 1956, *Constable* (BRI).

*Melaleuca diosmatifolia* was first described by Dumont de Courset in 1811 from cultivated material and he gave a detailed description of habit, branchlets and leaves comparing the species with *M. armillaris* and *M. ericifolia*. His description of the leaves 'Feuilles cylindriques, eparses, vertes et glabres, longues 13 a 15 millimetres, et larges de trois quarts' can only be applied to one taxon from eastern Australia although the dimensions given are slightly larger than usually found in native populations. This name predates that of *M. erubescens* Otto. Otto placed Dumont de Courset's name in synonymy in 1820.

Bentham placed this taxon under *M. ericifolia* Smith as a variety, but de Candolle and Cheel recognised it as a separate species under the name *M. erubescens* and placed *M. diosmatifolia* in synonymy, misspelling it 'diosmifolia'.

The species differs from *M. ericifolia* in having terete or slightly flattened leaves with large oil glands, no bracts, pink flowers with more stamens and longer claws but shorter free part of the filaments.

If only eastern Australian species are considered *M. fraseri* can only be placed here. The description given is within the range of variation of the species. The illustration of the staminal bundle and flower are typical of the species but the general habit indicates wider leaves. This may be due either to the plants being cultivated in very much different situations to its natural environment or to artistic license.

**54. *Melaleuca parvistaminea*** Byrnes, *Austrobaileya* 1: 75 (1984). **Type:** Victoria: beside Goulburn River, 4 miles [6 km] NW of Yea, Oct 1964, Muir 3549 (MEL, holo; AD, iso).

Shrub or small tree to 4 m high. Bark layered, rough. Branchlets glabrous. Leaves scattered or ternate, linear, shallowly concave above, acute to obtuse, narrowly attenuate at base, 4–11 mm long, *ca* 1 mm wide, glabrous, 3-veined, veins obscure, oil glands few but often visible; petioles to 1 mm long. Inflorescence a many-flowered, dense, axillary, terminal or subterminal spike; flowers single within each bract; rachis ovate to leaf-like at apex of spike, caducous; bracteoles absent. Calyx tube campanulate, 1–1.5 mm long, glabrous; lobes triangular, *ca* 0.5 mm long, glabrous. Petals pink at first, fading, circular or broadly ovate, with or without short claw, to 1.5 mm long. Stamens white or yellow, glabrous; claw to 0.5 mm long; filaments 4–7 attached to margin of each claw, free part to 3 mm long. Style 5–6 mm long; stigma small. Ovary *ca* 1 mm long, pubescent above. Fruit campanulate to cylindrical, *ca* 3 mm long and wide, orifice to 2 mm diam., calyx lobes persistent becoming obscure; in a dense spike.

South-eastern Australia from Shoalhaven River, New South Wales to central Victoria.

**Specimens examined.** Victoria. Tinamba–Glenmaggie Rd, Oct 1973, *Willis* (MEL); Mitchells Ck at road crossing near Mitchellstown, Jun 1963, *Aston* (MEL) Hong Huggets Rd, (37°48'S, 146°51'E), Jun 1978, *Gullan* 357 & *Turner* (MEL); S side of Glenmaggie Weir, ± 5 km N of Heyfield, *Beaglehole* 43360, *Willis* & *Chesterfield* (MEL); ± 20 km WNW of Seymour P.O., Aug 1975, *Beaglehole* 50111 (MEL). New South Wales. between Bungonia & Marulan, Nov 1966, *Pullen* 4176 (BRI); Shoalhaven R., Tolwagn, Jan 1956, *Constable* (BRI); Wallargaraugh R., Princess Hwy, Aug 1970, *Beaglehole* 33674 (MEL).

This species differs from *M. ericifolia* in having harder more fibrous bark, narrower and usually longer inflorescences and usually only 3 or 5 filaments attached to each claw. The oil glands are easily seen with a hand-lens as tubercles or black spots on dried material. *Willis* (1972) noted this as a possibly underscribed taxon though he considered it may have been *M. ternifolia* F. Muell. ex Miq. *M. ternifolia* is a narrow-leaved form of *M. ericifolia*.

**55. *M. pustulata*** J.D. Hook., *Lond. J. Bot.* 6: 476 (1847); Curtis & Stone, *Endem. Fl. Tas.* 6: 430 (1978). **Type:** Tasmania: Campbelltown & Oyster Bay, R.C. Gunn 1069 (NSW, iso).

Shrub to 5 m high. Bark (not seen). Branchlets shortly villous. Leaves scattered, flat or concave above, narrowly ovate to narrowly obovate, obtuse, attenuate at base, 4–10 mm

long, 1–1.6 mm wide, sparsely villous, soon glabrescent, obscurely 3-veined, oil glands large, commonly visible on lower surface; petioles *ca* 1.5 mm long, glabrous. Inflorescence a few- to many-flowered, short terminal spike; flowers single within each bract; rachis woolly, growing out after anthesis; bracts ovate-acuminate to nearly circular, 2–3 mm long, margins ciliate; bracteoles absent. Calyx tube turbinate to cylindrical, *ca* 2 mm long and wide, glabrous, pustulate; lobes semicircular, *ca* 0.5 mm long, with narrow claw, *ca* 1 mm long. Stamens yellow, glabrous; claw 0.4–1 mm long; filaments 5–7 attached to the margin of each claw, free part to 7 mm long. Style 6–7 mm long, glabrous (absent in male flowers); stigma capitate. Ovary *ca* 1 mm long, pubescent above. Fruit cylindrical to ovoid, to 3 mm long and wide, orifice *ca* 2 mm diam., calyx lobes absent; few in open spike.

Tasmania, endemic in central eastern coastal areas.

**Specimens examined.** Tasmania. East Coast Highway, 7.2 km N of Cranbrook, Oct 1978, *Gray* 297 (HO); Bluemans Ck, 2 km from Calvert Ck [3 km from Tasman Highway], Sep 1980, *Moscal* 449 (HO); East Coast, Gunn's Herbarium 1069 & Reids R., *Stuart* 405 (NSW); ex Archer Herbarium (NSW).

**56. *Melaleuca ericifolia*** Smith, Trans. Linn. Soc. Lond. 3: 276 (1797); illustrated Smith & Sowerby, Exot. Bot. 1: 64 (1804); Benth., Fl. Austr. 3: 159 (1867). **Type:** LINN *n.v.*

*M. gunniana* Schauer in Walpers, Rep. 2: 928 (1843). **Type:** Tasmania: Nile River, *Stuart* (MEL, iso).

*M. gunniana* var. *capitata* F. Muell. ex Miq., Neder. Kruidk. Arch. 4: 120 (1856). **Type:** van Diemensland, *Stuart* (MEL, iso).

*M. heliophila* F. Muell. ex Miq., Neder. Kruidk. Arch. 4: 120 (1856). **Type:** Victoria, prope Yarra, *F. Mueller* (MEL, iso).

*M. ternifolia* F. Muell. ex Miq., Neder. Kruidk. Arch. 4: 123 (1856). **Type:** Argyle country NSW, *F. Mueller* (MEL, iso).

Shrub or small tree to 8 m high. Bark layered, corky. Branchlets glabrous. Leaves scattered, or sometimes ternate or few opposite pairs, linear, shallowly concave above, acute, sometimes apiculate, narrowly attenuate at base, 7–15 (–18) mm long, *ca* 1 mm wide, glabrous, 1–3-veined, obscure, oil glands mostly obscure; petioles to 1 mm long. Inflorescence a dense, rarely open, terminal spike; flowers single within each bract; rachis shortly tomentose, growing out about anthesis; bracts ovate, to 1 mm long, deciduous; bracteoles absent. Calyx tube turbinate to campanulate, *ca* 1 mm long, glabrous; lobes ovate, to 0.8 mm long, herbaceous with narrow margin, glabrous. Petals white, circular with short claw, *ca* 1 mm long. Stamens white, glabrous; claw to 2 mm long; filaments 7–13 attached to margin near apex of each claw, free part to 6 mm long. Style to 8 mm long, glabrous (absent in male flowers); stigma capitate. Ovary *ca* 0.8 mm long, pubescent above. Fruit campanulate to cylindrical, 2.5–4 mm long and wide, orifice 1.5–3 mm diam., calyx lobes persistent, becoming obscure with age; usually in dense spike.

South-eastern Australia from Hastings River, N.S.W. to central Victoria and south to Tasmania.

**Selected specimens.** New South Wales. Chullora, Sep 1952, *King* (BRI); Victoria: 2 miles [3 km] S of Lang Lang, Oct 1959, *Aston* 389 (BRI); Phillip Island, Oct 1971, *Phillips* 140 (BRI). Tasmania: Georges Bay, near Launceston, *Simson* 13 (BRI).

**57. *Melaleuca squamea*** Labill., Nov. Holl. Pl. Spec. 2: 28, t. 168 (1806); Benth., Fl. Austr. 3: 155 (1867); Carrick & Chorney, J. Adelaide Bot. Gard. 1(5): 309 (1979). **Type:** Tasmania: “in capite Van-Diemen”, Labillardiere (MEL, iso).

*M. ottonis* Otto & Dietr., Allg. Gartenz. 3: 167 (1835). **Type:** Cult. Berlin Bot. Gard. (MEL, iso).

*M. squamea* var. *glabra* Cheel, J. Roy. Soc. N.S.W. 58: 193 (1924). **Type:** about 15 syntypes (all NSW), no lectotype has been chosen.

Shrub to 3 m high, rarely to 6 m high. Bark corky. Branchlets villous, glabrescent. Leaves scattered, flat or concave above, often incurved towards apex, acute or acuminate, cuneate or narrowly attenuated at base, 4–10 mm long, 1–3 mm wide, usually villous, sometimes nearly glabrous, 3- sometimes 5-veined, visible with lens, oil glands usually obscure;

petioles to 1.5 mm long. Inflorescence a few-flowered terminal head or short spike; flowers single within each bract; rachis villous, growing out after anthesis; bracts broadly ovate, apiculate, to 5 mm long, sometimes with 3–5 distinct veins, glabrous or villous towards apex, usually persistent to anthesis; bracteoles absent. Calyx tube turbinate to campanulate, sometimes angular, 2–3 mm long, glabrous to thinly villous, glabrescent; lobes semicircular to triangular with narrow margins, 0.1–1 mm long, glabrous to puberulous. Petals pink-purple, rarely nearly circular with a short claw, 2–3 mm long. Stamens purple, pink or rarely white, glabrous; claw 0.5–1 mm long; filaments 4–9 attached to margin of each claw, free part to 6 mm long. Style 4–10 mm long (absent in male flowers); stigma small to capitate. Ovary *ca* 1.5 mm long, pubescent above. Fruit urceolate to ovoid, 5–7 mm long and wide, orifice 2–4 mm diam., calyx lobes absent, rim undulate; in dense clusters or few.

South-eastern Australia from northern coastal New South Wales to eastern South Australia and Tasmania.

**Selected specimens.** New South Wales. *ca* 3 miles [5 km] N of Evans Head on Broadwater Rd, Sep 1973, *Coveny* 5107 (NSW, BRI); Botany, Aug 1895, *Baker* (BRI). Victoria. near Mt Rosea, Nov 1920, *Audas* (BRI). Tasmania. Mt Field National Park, Feb 1932, *White* 8270 (white-flowered form) (BRI).

There is a continuous range of variation within this species from almost glabrous to villous, and *M. squamea* var. *glabra*, described as being 'almost glabrous', cannot be maintained.

**58. *Melaleuca capitata*** Cheel, Proc. Roy. Soc. N.S.W. 58: 194 (1924). **Type:** New South Wales: Jervis Bay, Dec 1916, *Cambage* 4258 (NSW, lectotype–chosen here).

Shrub to 2 m high. Bark rough, scaly. Branchlets thinly villous, glabrescent. Leaves scattered, flat or concave above, linear, acute, often apiculate, cuneate at base, 10–25 mm long, 1–3 mm wide, villous, glabrescent, 3-veined, usually only midvein visible, oil glands obscure; petioles 1.5–3 mm long, thinly pubescent above. Inflorescence a few-flowered, dense, terminal head or short spike; flowers single within each bract; rachis villous, growing out after anthesis; bracts obovate acuminate to 5 mm long, villous; bracteoles absent or very small. Calyx tube turbinate to campanulate, 2.5–3.5 mm long, villous; lobes triangular, 1–2 mm long, villous, without hyaline margins. Petals white, rhomboidal to nearly circular with claw, 2.5–3.5 mm long. Stamens pale yellow, glabrous; claw 1–2 mm long; filaments 14–22 attached to margin near apex of each claw, free part to 8 mm long. Style 10–12 mm long, glabrous; stigma small. Ovary 1.5–2 mm long, pubescent above. Fruit nearly globose, ovoid or urceolate, 5–6 mm long, 4–7 mm wide, orifice 2–3 mm diam., calyx lobes deciduous; in short spikes or heads or few together.

South-eastern Australia, catchment areas of Shoalhaven and Clyde Rivers, New South Wales.

**Selected specimens.** New South Wales. Jervis, Jul 1899, *Maiden* (NSW); Nowra to Nerriga, Feb 1910, *Boorman* (NSW); Nowra Rd., *ca* 3 miles [5 km] NE of Nerriga, Nov 1965, *Adams* 1519 (BRI, CANB); Eastern scarp, Budawong Ra., Nov 1979, *Byrnes* 3941 (BRI).

Of the syntypes, the specimen from Jervis Bay collected by R.H. Cambage on 25 Dec, 1916 and held at NSW is representative of the species, matches the description and here is nominated as the lectotype.

**59. *Melaleuca dissitiflora*** F. Muell., *Fragm.* 3: 153 (1863); Benth., *Fl. Austr.* 3: 144 (1867); Carrick & Chorney, *J. Adelaide Bot. Gard.* 1290 (1979). **Type:** Northern Territory: "Inter flumen Bonney et montem Morphett", *J. Macd. Stuart* (MEL).

Shrub to 3 m high. Bark layered, papery. Branchlets glabrous or puberulous, soon glabrescent. Leaves scattered, flat, linear-elliptical or linear-obovate, apiculate, narrowly cuneate at base, 10–40 mm long, 1–2 mm wide, puberulous, glabrescent early, 3-veined, veins usually obscure, oil glands usually obscure; petioles to 2 mm long, poorly defined. Inflorescence a many-flowered, open or dense, terminal or upper-axillary spike; flowers solitary within each bract; rachis glabrous, growing out before anthesis; bracts linear-ovate, to 8 mm long, glabrous, caducous; bracteoles triangular, caducous (rarely seen). Calyx tube urceolate or cylindrical, 2–3 mm long, glabrous; lobes triangular to 1 mm long, glabrous. Petals white or partly pink, broadly ovate with short narrow claw, 1–3 mm long. Stamens white, glabrous; claw 3–4 mm long; filaments 15–30 attached to margin and inner surface of each claw; free part to 4 mm long. Style 4–6 mm long,

glabrous; stigma peltate. Ovary 1–2 mm long, pubescent above. Fruit urceolate, 3–4 mm long and wide, orifice 1–2 mm diam., calyx lobes semipersistent; in an open or dense spike.

Central Australia in drier areas of Northern Territory, western Queensland and central and northern South Australia.

**Selected specimens.** Northern Territory. Crown Ck, 5 miles [8 km] W of Conniston H.S., May 1956, *Chippendale* (BRI); Harts Ra., 6 miles [10 km] S of Police Station, Jul 1957, *Chippendale* (BRI); 30 miles [48 km] W of Elkedra H.S., Mar 1957, *Forde 744* (BRI). Queensland. BURKE DISTRICT: Lake Moondarra, ca 5 km N of Dam, Jul 1974, *Ollerenshaw 1211* (BRI).

**60. *Melaleuca lanceolata*** Otto, Pl. Rar. Hort. Berol. in Nees Hor. Phys. Berol. 36 (1820); Blake, Cont. Qd Herb. 1: 61 (1968); Carrick & Chorney, J. Adelaide Bot. Gard., 1(5): 295 (1979). **Type:** from plant cultivated in Berlin Botanic Gardens (G-DC, *n.v.*).

Synonyms: See Blake (*loc. cit.*).

Shrub or small tree to 10 m high. Bark black, rough, fissured. Branchlets pubescent, glabrescent. Leaves scattered, concave above or flat, linear-oblong to linear-ovate, acute, narrowly attenuate at base, 5–15 mm long, 1–3 mm wide, pubescent at first, soon glabrescent, 3-veined, veins usually obscure, oil glands obscure; petioles ca 1 mm long, usually pubescent above. Inflorescence a many-flowered, usually open, leafy, terminal-spike; flowers usually in triads; rachis pubescent, growing out before anthesis; bracts usually leaf-like; bracteoles present or absent, variously shaped. Calyx tube turbinate to subcylindrical, sometimes urceolate, 2–3 mm long, glabrous or sometimes puberulous towards base; lobes triangular, ca 1 mm long, without distinct margins. Petals white, ovate with short narrow claw, 1.5–2.5 mm long. Stamens white, glabrous; claw 1–1.5 mm long; filaments 8–14 attached to margin of each claw, free part 4–5 mm long. Style 5–7 mm long, glabrous, absent in male flowers; stigma small to capitate. Ovary 1–2 mm long, pubescent above. Fruit ovoid to urceolate, 4–5 mm long and wide, orifice ca 1 mm diam., calyx lobes semipersistent; in an open spike.

Southern Australia from Darling Downs, Queensland to south-western Western Australia.

**Selected specimens.** Queensland. DARLING DOWNS DISTRICT: Rocky Ck, near Millmerran, Jan 1958, *Roff* (BRI); Meandarra Rd, Feb 1975, *Williams 75001* (BRI). New South Wales. near Wyalong, Feb 1963, *Gauba* (BRI); Woolcunda Stn, 65 miles [104 km] S of Broken Hill, Jul 1955, *Constable* (BRI).

**61. *Melaleuca howeana*** Cheel, Proc. Roy. Soc. N.S.W. 58: 192 (1924). **Type:** New South Wales. Lord Howe Island, in 1898, *E. King & J. Maiden* (NSW).

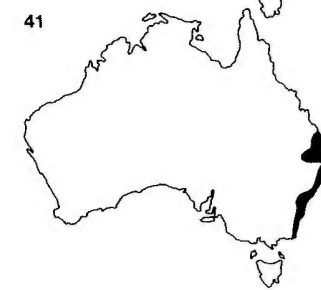
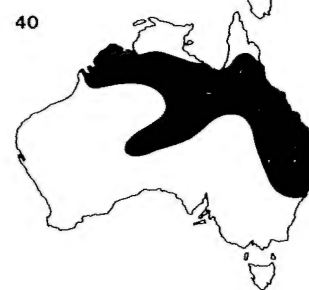
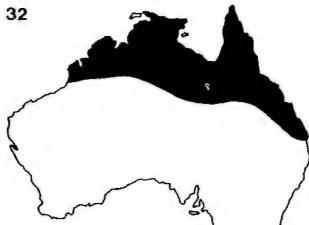
Shrub to 1 m high. Bark layered and hard. Branchlets glabrous. Leaves scattered, linear-oblong, flat, obtuse, attenuate at base, 4–8 mm long, 1–1.5 mm wide (juvenile leaves ovate to 15 mm long, and 5 mm wide), glabrous, 1–3-veined, veins obscure, oil glands obscure. Inflorescence usually a few-flowered, open terminal spike; flowers single within each bract; rachis tomentose, growing out after anthesis; bracts variously shaped, to 3 mm long; bracteoles broadly ovate, to 1 mm long. Calyx tube cylindrical to campanulate, 2–2.5 mm long, glabrous; lobes triangular to ovate with narrow ciliate margins, to 1 mm long, glabrous. Petals white, nearly circular, truncate or with short claw, 1–2 mm long. Stamens white, glabrous; claw ca 1 mm long; filaments 8–10 attached to margin of each claw, free part to 5 mm long. Style 5–6 mm long, glabrous; stigma small. Ovary ca 1.5 mm long, pubescent above. Fruit cylindrical to campanulate, to 5 mm long, 3–4 mm wide, orifice 2–2.5 mm diam., calyx lobes persistent; in an open spike.

Eastern Australia: Lord Howe Island.

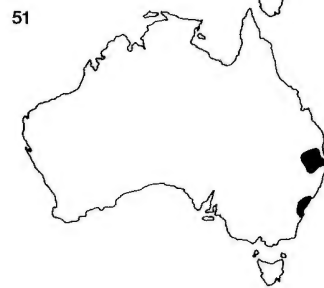
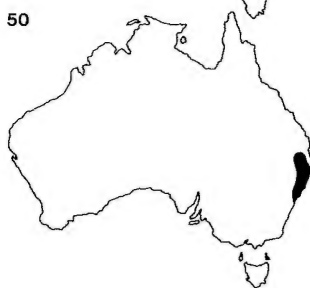
**Selected specimens.** Lord Howe Island, Oct 1963, *Hoogland 2624* (NSW, BRI) & May 1920, *Boorman* (NSW).

## References

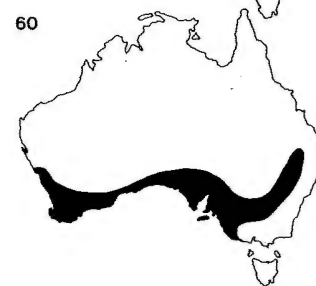
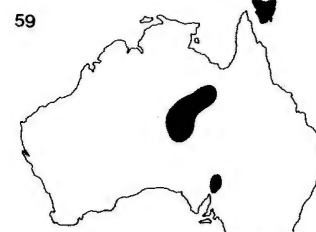
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**Maps** 32. *Melaleuca nervosa*. 33. *M. dealbata*. 34. *M. stenostachya*. 35. *M. sericea*. 36. *M. cajuputi*. 37. *M. argentea*. 38. *M. leucadendra*. 39. *M. viridiflora*. 40. *M. bracteata*. 41. *M. styphelioides*.



**Maps 42.** *Melaleuca viminalis*. **43.** *M. arcana*. **44.** *M. saligna*. **45.** *M. groveana*. **46.** *M. deanei*. **47.** *M. sieberi*. **48.** *M. kunzeoides*. **49.** *M. armillaris*. **50.** *M. alternifolia*. **51.** *M. decora*.



Maps 52. *Melaleuca linophylla*. 53. *M. diosmatifolia*. 54. *M. parvistaminea*. 55. *M. pustulata*. 56. *M. ericifolia*. 57. *M. squamea*. 58. *M. capitata*. 59. *M. dissitiflora*. 60. *M. lanceolata*. 61. *M. howeana*.



**COMBRETUM TRIFOLIATUM VENT. (COMBRETACEAE)  
A NEW RECORD FOR AUSTRALIA**

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**Summary**

The genus *Combretum* Loebl. (Combretaceae) is recorded for the first time from Australia with the discovery of *C. trifoliatum* Vent. in northern Cape York Peninsula. The species is described and figured from Australian material. A key to the Australian genera of Combretaceae is given.

*Combretum* Loebl. is a genus of about 250 species which is widespread throughout the tropics of both the Old and New World being most abundant in Africa (Exell 1954). This is the first record of the genus from Australia. The species was discovered independently by both authors in the course of plant collecting on Cape York Peninsula.

The description and illustration presented here are based solely on Australian material. According to Exell (1954) the flowers shrink considerably on drying. Although fluid preserved material was available for study only dried flowers were used for measurements given in the description to allow for valid comparison with previous published descriptions.

***Combretum trifoliatum* Vent., Choix Pl. t. 58 (1808)**

Vigorous woody climber to 15 m tall. Mature stems to 3 cm diam., with a flaky bark. Young stems twining in an anticlockwise direction (externe vis.), densely pubescent with brown, simple hairs 0.1-0.2 mm long and scattered, white, simple hairs 0.4-0.5 mm long. Leaves opposite or in whorls of 3 (or 4), simple, exstipulate; petiole (3-) 5-7 (-9) mm long, densely pubescent with short, brown, simple hairs; leafblade ovate to elliptic, (7-) 9-13 (-15) cm long, (3.5-) 4.5-6 (-7.5) cm wide, chartaceous, somewhat discolorous, sparsely pubescent beneath when young, glabrescent except for domatia on lower surface and occasional short, brown, simple hairs along the mid-vein on both upper and lower surfaces; base obtuse; margin entire; apex acute to obtuse; venation reticulate, unicostate, camp todomous; mid-vein impressed above, raised beneath; primary lateral veins 6-8 pairs, plain above, slightly raised beneath. Inflorescence terminal and axillary, an open panicle of spikes or occasionally a simple spike; spikes (2-) 3-5 cm long, on peduncles (0.5-) 1-1.5 (-2) cm long, 25-50-flowered; bracts linear, 2-2.5 mm long, 0.2-0.3 mm wide, sericeous, caducous. Flowers regular, 5-merous, bisexual, protogynous, white to cream; calyx tube clearly divided into a lower part surrounding and adnate to the ovary 1.5-2 mm long and an upper cupuliform part 0.75-1.1 mm deep  $\times$  2.4-2.6 mm wide, densely sericeous on both inner and outer surfaces; calyx lobes 5, narrowly triangular, 0.9-1.2 mm long, sericeous; petals 5, inserted in a single series at the mouth of the receptacle, lanceolate, 1-1.2 mm long, 0.3-0.4 mm wide, sericeous; stamens 10, exserted, erect and spreading at anthesis, adnate to wall of receptacle, inserted in 2 series, those opposite sepals at base adjacent to disc, those opposite petals higher about mid way between disc and orifice; filaments filiform, 3.5-4.5 mm long, glabrous, anthers oblong, 0.3 mm long, 2-celled, medifixed, versatile, opening by longitudinal slits; disc prominent, irregularly lobed, densely barbate; ovary inferior, unilocular, with 2 pendulous anatropous ovules; style terminal, 3.5-5 mm long, glabrous or with a few long, straight hairs on the lower two-thirds; stigma terminal, ca 1 mm diameter. Fruit sessile, oblanceolate to narrowly elliptic in outline, star-shaped in cross section, (3-) 3.5-4 mm long, 1-1.2 cm wide, with 5 rigid wings, indehiscent; pericarp coriaceous, shiny dark brown, glabrous. Fig. 1.

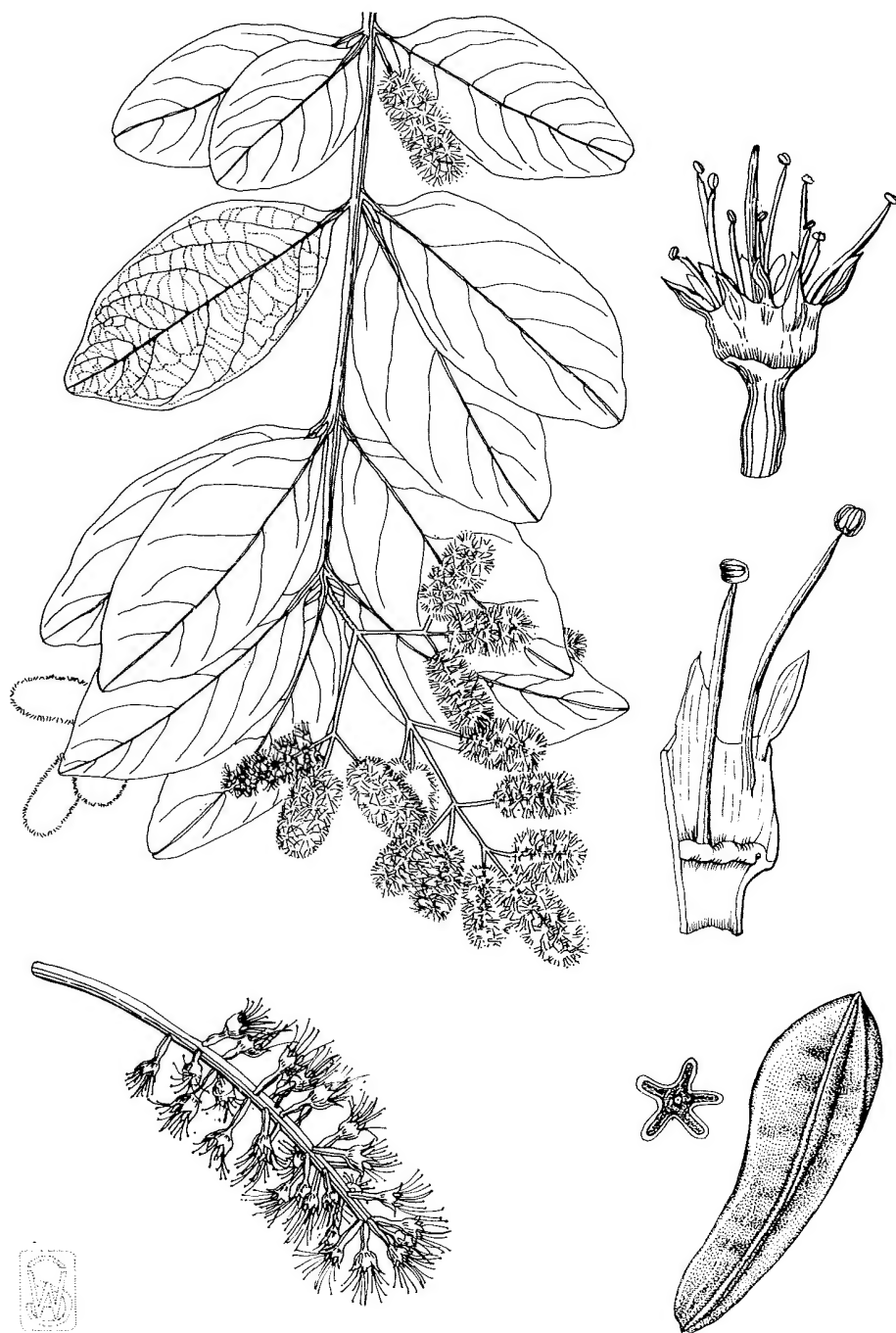


Fig. 1. *Combretum trifoliatum*: A. flowering branch  $\times 1/2$ . B. flower (hairs not shown)  $\times 4$ . C. partly dissected flower (hairs not shown)  $\times 4$ . D. mature fruit  $\times 1$ . E. cross section of mature fruit  $\times 1$ . A-C from Clarkson 4989, E & F from Clarkson 5650.

**Distribution:** Within Australia the species is known only from the Wenlock River, north-east of Weipa, where it is a common vine on the margins of closed forest along the river banks. Exell (1954) shows the extra-Australian distribution extending from Burma south through Southeast Asia to Malaysia and east through Indonesia to Papua New Guinea.

**Specimens examined:** Irian Jaya: Bernhard Camp, Idenburg R., Apr 1939, *Brass* 13786 (BRI); Bernhard Camp, Idenburg R., Apr 1939, *Brass* 14043 (BRI); Merau R., N of the mouth of the Wanggoe R., Aug 1954, *van Royen* 4680 (BRI). Papua New Guinea: Yellow R., near Sepik R., Oct 1949, *Womersley* NGF 3893 (BRI); Lake Daviumbu, Middle Fly R., Sep 1936, *Brass* 7709 (BRI); Balamuk, near Bensbach, Sep 1979, *Painup* s.n. [QRS 069719]. Australia: Queensland. COOK DISTRICT: Wenlock R., Stone Crossing (12°23'S, 142°10'E), Oct 1980, *Hyland* 10689 (QRS), 10755 (QRS), 21086V (QRS), Aug 1983, *Clarkson* 4989 (BRI, CANB, DNA, K, L, MO, NSW, PERTH, QRS, SAR); S bank of Wenlock R. at Stone Crossing on Weipa to Bertihough rd, Nov 1984, *Clarkson* 5650 (BRI, CANB, DNA, K, L, MO, NSW, PERTH, QRS, SAR); Wenlock River, upstream from islands (12°15'S, 142°01'E), Feb 1985, *Gunness* AG1894 (BRI, QRS).

*Combretum* is readily distinguished from other Australian genera of Combretaceae by its twining habit, the lack of bracteoles adnate to the receptacle and the free style. Since the publication of Byrnes's revision of the Australian Combretaceae (Byrnes 1977) this is the second genus added to the family in Australia. The first was *Dansiea* which was erected in 1981 for a large, rainforest tree from coastal north Queensland (Byrnes 1981). The following key distinguishes the five native Australian genera and one exotic genus which has become naturalised in places.

#### Key to the Australian Genera of Combretaceae

- |  |                        |
|--|------------------------|
| 1. Receptacle without adnate bracteoles . . . . .                  | 2                      |
| Receptacle with two adnate bracteoles . . . . .                    | 4                      |
| 2. Petals absent, flowers bisexual or staminate . . . . .          | <b>Terminalia</b>      |
| Petals present, flowers bisexual . . . . .                         | 3                      |
| 3. Style adnate to the receptacle for part of its length . . . . . | <b>Quisqualis*</b>     |
| Style free, not adnate to the receptacle . . . . .                 | <b>Combretum</b>       |
| 4. Ovules 2-5 . . . . .  | <b>Lumnitzera</b>      |
| Ovules 6 or more . . . . .   | 5                      |
| 5. Disc narrow, cupular; ovules 6-12 . . . . .                     | <b>Macropteranthes</b> |
| Disc bi-lobed, gland-like; ovules 14-20 . . . . .                  | <b>Dansiea</b>         |

\* Naturalised alien

#### Acknowledgements

We wish to thank Mr W. Smith of the Queensland Herbarium, Indooroopilly who prepared the illustration, the Director of the Queensland Herbarium for the loan of material and Mrs A. Gunness of Weipa who collected fruiting material at our request. Technical assistance for flora inventory studies on Cape York Peninsula by J. Clarkson is supported by a grant from the Australian Biological Resources Study.

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**ACACIA EREMOPHILOIDES (MIMOSACEAE)**  
**A NEW SPECIES FROM SOUTH-EASTERN QUEENSLAND**

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**Summary**

A new species of *Acacia*, *A. eremophiloides* is described and compared with *A. ixodes* Pedley. It has a restricted distribution in the southern part of the Burnett District. Associated vegetation includes *Newcastelia velutina* Munir, previously known only from the type collection. It and *A. eremophiloides* are Conservation Coded 2V in the system of Leigh *et al.* (1981).

During field collecting activities in the Mundubbera Shire, south-east Queensland, a population of a distinctive *Acacia* allied to *A. ixodes* Pedley was discovered. It differs from *A. ixodes* in having thicker, more resinous phyllodes with hyaline margins and midribs and more elongate pods.

**Acacia eremophiloides** Pedley & P. Forster, **sp. nov.** affinis *A. ixode* Pedley phyllodiis crassioribus elongatioribus hyalina costa margineque praeditis, leguminibus longioribus differt. **Typus:** Forster 1890A (BRI, holotypus; BRI, CANB, K, MEL, MO, PERTH, isotypi).

Frutex usque 2.5 m altus; ramuli tenues glabri resinosi juniores flavidi, vetusiores brunnei; stipulae ca 0.5 mm longae, persistentes. Phyllodia leviter falcata linearia obtusa latissima prope apicem mucronulata interdum glande parva in dorsali latere mucronis, resinosi ubi juvenes, glabra 4-6.5 cm longa, 2.5-3 mm lata, 15-25 plo longiora quam lata, crassa, costa prominente elevata hyalina et margine hyalina, penninervia obscure inter eas; glans perparva e basi 1-1.5 mm posita vel deest. Pulvinus 1-1.5 mm longus. Capitula ca 20 flora in pedunculis glabris 8-10 mm longis in axillis singulatim binatimve disposita. Flores 5-meri; calyx glaber resinosis non costatus, 0.8 mm long breviter lobatus; corolla 2 mm longa lobata ad medium lobis costatis; stamina ca 3.5 mm longa; ovarium glabrum. Legumen dehiscens cinnamomeum resinosis valvis convexis super semina et marginibus nervatis, continens usque 11 semina, usque 8 cm longum, 3.5 mm latum. Semina longitudinaliter disposita, 3.3 mm longa, 2 mm lata, 1.5 mm crassa; funiculus albidus incrassatus et 2-3 plo plicatus faciens arillum cupularem basi; pleurogramma tenuis distincta; areolus grandis apertus.

Shrub to 2.5 m; branchlets slender, glabrous, resinous, yellowish becoming brown; stipules ca 0.5 mm long, persistent. Phyllodes slightly curved, linear, obtuse, widest near the tip, mucronulate with sometimes a small gland on the dorsal side of the mucro, resinous when young, glabrous, 4-6.5 cm long, 2.5-3 mm wide, 15-25 times as long as wide, thick with a prominent raised hyaline midrib and hyaline margins, obscurely penninerved between them; gland extremely small, 1-1.5 mm from the base or absent; pulvinus 1-1.5 mm long. Heads on peduncles 8-10 mm long, single or in pairs in the axils. Flowers 5-merous; calyx glabrous, resinous, without ribs, 0.8 mm long with short lobes; corolla 2 mm long, lobed to the middle, the lobes with distinct midribs; stamens ca 3.5 mm long; ovary glabrous. Pod dehiscent, cinnamon-brown, resinous, with valves convex over the seeds and nerverlike margins, with up to 11 seeds, to 8 cm long, 3.5 mm wide. Seeds arranged longitudinally, 3.3 mm long, 2 mm wide, 1.5 mm thick; funicle whitish, thickened and folded 2-3 times forming cupular aril at the base; pleurogram fine, distinct; areole large, open. **Figs 1 & 2.**

BURNETT DISTRICT: "Rocky" Paddock, "Manar", 45 km SSE of Mundubbera, 151°21'E, 26°00'S [BOONDOOMA 9145-345321], 7 Sep 1984, Forster 1890A (fls) (TYPE: BRI, holo; BRI, CANB, K, MEL, MO, PERTH, iso), & 22 Nov 1984, Forster 1890B (frt) (BRI).



Fig. 1. Plant of *Acacia eremophiloides* from which the type (Forster 1890A) was collected.

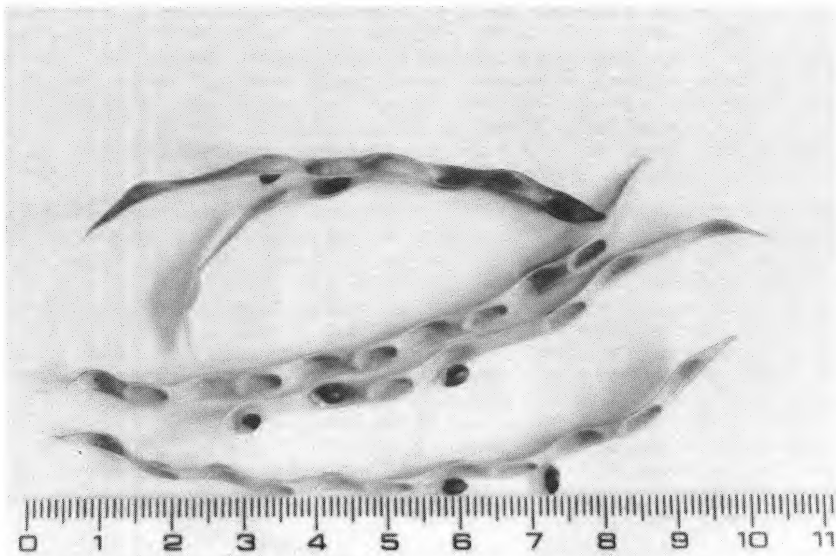


Fig. 2. Fruit and seed of *Acacia eremophiloides* (Forster 1890B).

**Ecology:** The species is apparently restricted to an area of some 4–5 hectares in a number of discontinuous populations. It occurs between 460–550 m altitude, among rock ledges and crevices where individuals may be quite common. Associated vegetation includes *Hibiscus splendens* J. Fraser ex Graham, *Hybanthus monopetalus* (Roemer & Schultes) Domin, *Hoya australis* R.Br. ex Traill, *Leptospermum flavescens* Smith, *Hibbertia linearis* R.Br. ex DC., *Psilotum nudum* (L.)Beauv., *Trachymene* sp. nov. (PIF 1948), and *Newcastelia velutina* Munir.

Whereas the type plant (Fig. 1) was under 1 m in height, old individuals may reach 2.5 m before dying. The habitat is generally free of fire due to its rocky nature. Widespread flowering observed in September 1984 was followed by copious fruiting in November (Fig. 2). Young seedlings were not particularly noticeable in 1984.

This species appeared to be absent from the adjoining open heathland–low eucalypt open-forest dominated by *Eucalyptus exserta* F. Muell., *Acacia tenuinervis* Pedley, *Triodia irritans* R.Br. var. *laxispicata* N.T.Burb. form C, *Astrotriche pterocarpa* Benth., *Schoenus brevifolius* R.Br. and *Melaleuca sieberi* Schauer. This community with less exposed rock is subject to irregular wildfires and large fuel loads of the *Triodia* are often present.

**Conservation Status:** Suitable habitat at similar altitude to the known population of *A. eremophiloides* has not been located within 30 km of the "Manar" site (Fig. 3). The site is unusual inasmuch that similar topography and with the associated vegetation types has not been observed within other parts of the Burnett District. Similar vegetation associations occur at the Blackdown Tableland, Leichhardt District and 18–25 km west of Westmar on the Moonie Highway, Darling Downs District. Due to its restricted occurrence this species' Conservation Coding may be listed as 2V (Leigh *et al.* 1981). Seed collected in November germinated satisfactorily without pretreatment and seedlings are relatively easy to maintain in cultivation.

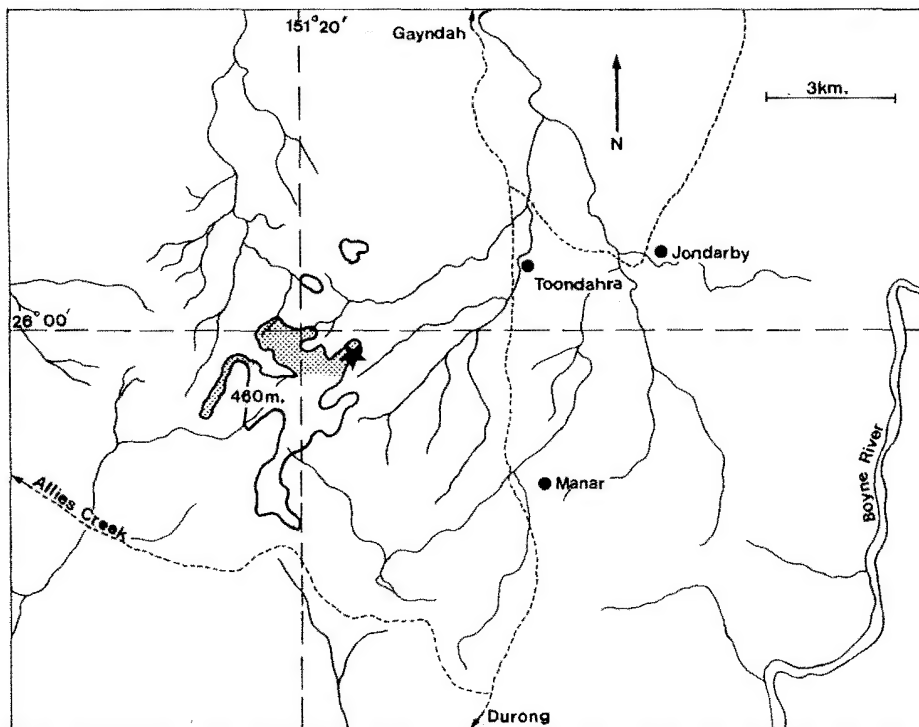


Fig. 3. Distribution map showing disposition of pastoral properties listed, topography above 460 m shaded which includes suitable habitat for *A. eremophiloides*. \* indicates type collection site.

*Newcastelia velutina* (Chloanthaceae), which previously was known only from the type collection (Munir 1978), is closely associated with *A. eremophiloides* and is of interest due to its own rarity and in the possible location of further populations of this rare wattle. The type locality for *N. velutina* is not known with certainty, and suitable habitat does not exist where various interpretations of the label data would place it. It is possible that the original collection came from a chance individual washed down as seed to a site closer to the Gayndah-Durong road. *Newcastelia velutina* was apparently overlooked by Leigh *et al.* (1981, 1984) in their compilations of extinct, rare and endangered Australian plant life, but may be considered as being of similar Conservation Coding (2V) as *A. eremophiloides*.

The general area comprising the pastoral properties of Benvenue, Blackdown, Jondarby, Manar, Mimosa and Toondahra carries a number of vegetation communities with several rare species represented. Major occurrences of *Acacia grandifolia* Pedley, *A. tenuinervis* Pedley, *A. sp. aff. A. penninervis* Sieb. ex DC. (PIF 1745) and *Aotus subglauca* Blakely & McKie var. *filiformis* Blakely & McKie are present.

Due to the rugged terrain, extensive agricultural development is unlikely. Continued degradation of the communities, especially at lower altitudes, is likely due to timber harvesting, timber clearing and indiscriminate burning. Conservation of what appears to be unique vegetation communities is recommended.

**Etymology:** Alluding to the superficial similarity of small individuals to species of *Eremophila*.

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## STUDIES IN AUSTRALIAN GRASSES: 3\*

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## Summary

*Aristida dominii* sp. nov. from northern Australia is diagnosed. *A. browniana* Henrard and its synonyms are placed in synonymy under *A. holathera* Domin and *A. holathera* var. *latifolia* is a new combination.

Soon after the submission of my paper describing new taxa of *Aristida* in Australia (Simon 1984) it became apparent that another new species from northern Australia needed circumscription. An examination of the type of *A. hirta* Domin revealed it to be a specimen of *A. superpendens* Domin with immature lemmas and that most of the material placed under the name *A. hirta* in Australian herbaria was an annual species taxonomically distinct from the perennial *A. superpendens*. A new name is thus required for this species. The distinctness of the type of *A. hirta*, when compared with the rest of the material placed under this name, was referred to by Lazarides (1980) but he made no taxonomic changes then.

*Aristida dominii* B. Simon sp. nov. affinis *A. superpendenti* Domin sed annua, culmo brevior, lemmate brevior (ad 7.5 mm longum), laminis setaceis, brevioribus pilis ligulae differt. **Typus:** J.R. Clarkson 4801 (holotypus BRI; isotypi AD, CANB, DNA, K, MEL, MO, NSW, PERTH, QRS). **Fig. 1.**

**Western Australia.** FITZGERALD DISTRICT: Karunjie Station, Mar 1950, *Rust* 95 (CANB). **Northern Territory.** DARWIN AND GULF: El Sharana, Feb 1973, *Lazarides* 7829 (BRI, CANB, NSW, PERTH); Katherine Experiment Station, Feb 1947, *Wyn* 97 (CANB); Cox River Station, Jul 1977, *Latz* 7262 (BRI, CANB, DNA, NT). **Queensland.** COOK DISTRICT: 37 km SSE of Aurukun, May 1982, *Clarkson* 4384 (BRI); Koyanyama, Feb 1978, *Alpha* 524 (BRI); 7 km N of North Kennedy R., Apr 1983, *Clarkson* 4801 (AD, BRI, CANB, DNA, K, MEL, MO, NSW, PERTH, QRS); Cairns, Jul 1938, *Flecker* 5006 (QRS); Chillagoe, Apr 1938, *Blake* 13628 (BRI, CANB, K, NSW); Gilbert R., Feb 1925, *Brass* 431 (BRI, CANB), Mar 1927, *Brass* 1707 (BRI); Forest Home Station, Mar 1931, *Brass* 1849 (BRI, CANB), BURKE DISTRICT: Normanton, May 1935, *Blake* 8961 (AD, BRI, CANB, K, MO, NSW, NT, PERTH, PRE), Mar 1954, *Lazarides* 4303 (AD, BRI, CANB, MEL, NSW, NT, PERTH); 5 km W of Plains Creek Station, Apr 1974, *Jacobs* 1350 (NSW); Croydon, May 1935, *Blake* 9111 (BRI, CANB, K, MEL, NT), Aug 1936, *Blake* 12458 (BRI, CANB, NSW, PERTH, QRS).

A full description of the species was given by Lazarides (1980) under *A. hirta*. Characters of *A. dominii* which distinguish it taxonomically from *A. superpendens* are the slender annual culms which are generally shorter, the setaceous leaf blades, the shorter lemma and a ligule with much shorter hairs. In my key to *Aristida* in Australia (Simon 1984) *A. dominii* should be substituted for *A. hirta* in the first couplet of dichotomy 8.

During a recent examination of the morphological attributes of Australian *Aristida* species it was discovered that the material to which the name *A. holathera* Domin has been applied was not distinct from *A. browniana* Henrard. In my opinion the latter species has a broad curly-leaved variety and the narrow-leaved type variety, itself very variable, within which *A. holathera* can easily be accommodated. The other differences reported in the literature (indistinct vs. distinct lemma articulation, 3-nerved vs. 1-nerved lower glume and unequal vs. equal lemma awns) do not hold on closer scrutiny. As *A. holathera* is the earlier name, however, it has to be taken up, resulting in the following nomenclatural changes.

\*Continued from Austrobaileya 2: 238 (1986).



FLORA OF QUEENSLAND  
15.27s 144.07 E ab  
coll J.R. Clarkson 4801 28 Apr. 1983

QUEENSLAND HERBARIUM: BRISBANE  
COOK DISTRICT

394493

Aristida

Family: Poaceae  
GRAM1

7 km N of the North Kennedy River on the Peninsula Development Road.  
A broad shallow longitudinal depression carrying an open woodland of *Eucalyptus polycarpa* and *Melaleuca viridiflora* with a dense grass layer.  
A common grass occurring in drifts.

Dug. - QRS, CANE, K, NSW, DNA, Perth, Mo, AP, MEL

*Aristida dominii* B.K. Simon

det. B.K. Simon 20/8/85 Herb. BRI

HOLOTYPE

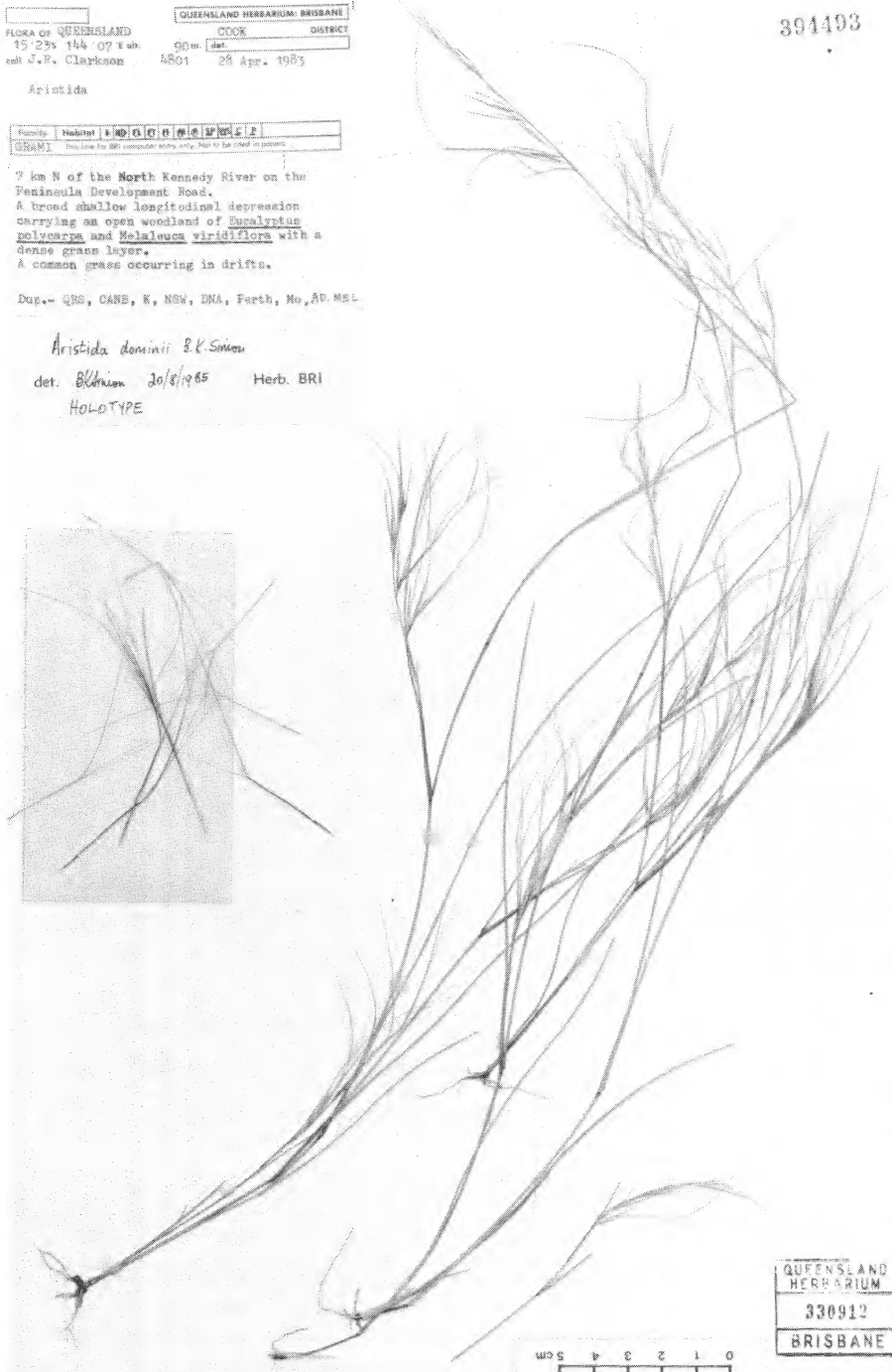


Fig. 1. Holotype of *Aristida dominii*.

**Aristida holathera** Domin, Biblioth. Bot. 85:340 (1915). **Type:** near Chillagoe, Feb 1910, K. Domin, (holotype L (Herb. Lugd. Bat. 953 346 286 and 926 361 524); isotype BRI (BRI 061558)).

*A. stipoides* R.Br., Prodr. 174 (1810), non Lamark (1791). *A. stipoides* var. *normalis* Domin, Biblioth. Bot. 85: 337 (1915). *A. browniana* Henrard, Meded. Rijks Herb. 54: 63 (1926), **synon. nov.** **Type:** R. Brown [6197] (lectotype BM (selected here), specimen annotated by Robert Brown—*Aristida stipoides*, Carpentaria Island Nov 22, 1802).

*A. stipoides* var. *brachyathera* Domin, Biblioth. Bot. 85: 337 (1915). **Type:** K. Domin (syntypes from Cloncurry and Pentland, *n.v.*).

*A. muelleri* Henrard, Meded. Rijks Herb. 54A: 358 (1927). **Type:** D. Molineux 8 (holotype L (Herb. Lugd. Bat. 926, 361–526) fragment BRI; isotypes, MEL (MEL 582062 and MEL 582063) fragment BRI.

**Aristida holathera** Domin var. *latifolia* (B. Simon)B. Simon, **comb. nov.**

*Aristida browniana* Henrard var. *latifolia* B. Simon, Austrobaileya 2: 95 (1984), **synon. nov.** **Type:** P.K. Latz 2811 (holotype BRI; isotypes CANB, DNA, NT).

As a result of these nomenclatural changes my key to *Aristida* in Australia (Simon 1984) should be amended to exclude couplet 9 and the names *A. holathera* var. *holathera* and *A. holathera* var. *latifolia* should be substituted for *A. browniana* var. *browniana* and *A. browniana* var. *latifolia* respectively in couplet 12.

#### Acknowledgements

I extend my thanks to the Australian Biological Resources Study for financial support for work on *Aristida*, to the Directors of AD, BM, CANB, DNA, L, MEL, NSW, NT and PERTH for the loan of herbarium material and to Mr H. Dillewaard for the photograph of the holotype.

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## NEW FERN RECORDS FOR AUSTRALIA

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and B. Gray

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### Summary

Three species and one variety of fern, *Ctenopteris repandula* Kunz, *Dicranopteris linearis* var. *altissima* Holttum, *Gleichenia milnei* Baker and *Ophioglossum intermedium* J.D. Hook. are recorded from Australia for the first time. In addition *Asplenium unilaterale* Lam. is confirmed as occurring in Australia and the status of *Ophioglossum lineare* Schlechter & Brause as a distinct taxon is upheld.

This paper records new fern taxa which have been discovered in the course of studies on the pteridophytes of tropical Australia.

### ASPLENIACEAE

*Asplenium unilaterale* Lam. in Lam. & Poiret, Encycl. 2: 305 (1786)

The first confirmed Australian specimens of *A. unilaterale* were collected on the Atherton Tableland by Chinnock and Brownsey in October 1982. The species has been included in the Australian flora (e.g. Andrews, in press) but confirmatory specimens have been lacking. Early records of the species by Maiden & Betche were based on misidentified specimens collected by R.F. Waller in Evelyn Scrub near Herberton in 1908 (Andrews, in press).

*A. unilaterale* is widely distributed from tropical Africa to Asia, China, Japan, Polynesia and New Guinea. Its collection in Australia was to be anticipated. In Australia the species is so far known only from a single locality in a deep rainforest gully growing in orange basalt clay loam and larva-ash just above a stream. The species can be distinguished from other Australian species of *Asplenium* by the pinnae being all nearly equal in size and with the basiscopic margin of each reduced to a small wing.

Queensland, COOK DISTRICT: Reserve 784, Parish of Bartle Frere, Topaz Rd, 17°24'S, 145°42'E, 700 m, Oct 1982, Chinnock 5737 & Brownsey (AD, BRI), 21 Sep, 1983, Gray 3244 (QRS) & Jones 1260 (BRI).

### GLEICHENIACEAE

*Gleichenia milnei* Baker, Syn. Fil. 449 (1874)

Fertile specimens of this species were collected during the Australian Orchid Foundation expedition to northern Cape York Peninsula in September 1983. Plants were growing in shallow clay-loam in open forest close to riverine rainforest.

The material agrees well with descriptions in Flora Malesiana (Holttum 1959), and Holttum has confirmed the identification (pers. comm.). The species is known from the Celebes, Moluccas, Admiralty Islands, Solomon Islands, Vanuatu and New Guinea. This is the first record from Australia. It belongs to the subgenus *Mertensia* and can be distinguished from other Australian species of *Gleichenia* by the stipule-like dissected leaflets present at the branchings of the main rachis.

Queensland, COOK DISTRICT: banks of Hann Ck, 35 km E of Moreton Telegraph Station, 12°28'S, 142°55'E, 100 m, Sep 1983, Jones 1198, Gray & Collins (BRI, QRS, K).

*Dicranopteris linearis* var. *altissima* Holttum, Reinwardtia 4: 276 (1957)

Among specimens of *Dicranopteris linearis* (N. Burman) Underw. var. *linearis* at the Queensland Herbarium, is a collection which is referable to *D. linearis* var. *altissima* Holttum. This widespread variety (Malay Peninsula, Philippines, Moluccas, Solomon Islands and New Guinea) has not previously been recorded from Australia.

Plants have a tall climbing habit (to 6 m or more) with a pair of supra-axillary accessory branches on all forks in the main rachis. Plants of this variety have been recorded as occurring on forest margins at low altitudes.

Queensland. COOK DISTRICT: ca 16 km NNW of Daintree, 16°03'S, 145°13'E, Nov 1967, *Boylard 420 & Gillieatt* (BRI).

*Dicranopteris linearis* is in need of further investigation in Australia. Holttum (1959) records 13 varieties for Malesia. Three varieties have now been recorded in Australia but considerable variation exists in var. *linearis* particularly with respect to the morphology and persistence of hairs and the degree of glaucousness of the undersurface of fronds.

#### Key to the varieties found in Australia

1. Accessory branches always present at ultimate forks, the branches set 3–6 mm above the fork (high climbing fern to 6 m tall) . . . . . var. *altissima*  
     Accessory branches usually absent from ultimate forks, if present then situated at or just below the junction (ferns to 3 m tall) . . . . . 2
2. Hairs persistent on lower surfaces of veins . . . . . var. *subferruginea* (Hieron.) Nakai  
     Hairs not present on lower surface of veins . . . . . var. *linearis*

### GRAMMITIDACEAE

#### *Ctenopteris repandula* Kunz, Syst. Verz. 37 (1854)

Plants of this species have been collected on three occasions from highland areas of the Atherton Tableland. In each case the plants were growing among moss on large, sheltered boulders. Specimens were identified by Barbara Parris of Kew.

The species was described from material collected in Sri Lanka (Sledge 1960) and is relatively common in New Guinea (Parris pers. comm., Copeland 1952). This is the first record from Australia. It can be distinguished from other Australian species by its relatively large naked sori and the repand segments with hairy margins.

Queensland. COOK DISTRICT: State Forest Reserve 194, Parish of Western, 17°18'S, 145°26'E, 1200 m, Aug 1981, *Jones 27 & Gray* (BRI, QRS, K), July 1983, *Jones 1170 & Gray* (BRI); Sluice Ck, Portion 36, Parish of Ravenshoe, 17°33'S, 145°32'E, 1100 m, July 1983, *Jones 1061, Gray & Lockyer* (BRI).

### OPHIOGLOSSACEAE

#### *Ophioglossum intermedium* J.D. Hook., Ic. Pl. 10, t. 995 (1854)

Unidentified *Ophioglossum* specimens at the Darwin Herbarium (DNA) included two sheets of *O. intermedium*. Field collections by the senior author have extended the range to five more localities. These are the first records of this species from Australia. It is also known from Central Sumatra, West Java, North and West Borneo and the Philippines (Wieffering 1964).

*O. intermedium* is in the subgenus *Ophioderma* and is readily recognised by the fertile part being attached peltately to the tropophyll, one third to one quarter from its base. Also the common stalk gradually expands into the tropophyll so that the demarcation between the two is not clear cut as it is in all other Australian terrestrial species of *Ophioglossum*.

In Australia, *O. intermedium* is restricted to northern parts of the Northern Territory. It grows among roots in accumulations of leaf litter in dense rainforest. Its occurrence in north-eastern Queensland is to be anticipated.

Northern Territory. DARWIN AND GULF DISTRICT: Adelaide River, Daly River Rd, 13°30'S, 131°33'E, Jul 1982, *Rankin 2610* (DNA); Melville Is., Jump-up Jungle, 11°31'S, 130°22'E, Nov 1983, *Dunlop 6548* (DNA); Feb 1984, *Jones 1310* (DNA); Melville Island, Hanguana Jungle, 11°32'S, 130°42'E, March 1984, *Jones 1317* (DNA, BRI); 3 km SE of Jim Jim Falls, Arnhem Land, 12°19'S, 132°52'E, March 1984, *Jones 1515* (DNA); Melville Island, 10 km from 3 ways, Garden Point rd, 11°33'S, 130°43'E, Dec 1984, *Jones 1665* (DNA, BRI); Melville Island, Imanawati, 11°33'S, 130°32'E, Dec 1984, *Jones 1679* (DNA).

**Ophioglossum lineare** Schlechter & Brause, in Engl. Bot. Jarb. 49: 59 (1912)

This species has proved to be common in parts of Arnhem Land. It is a remarkable simple fern and some authors have suggested that it may be a sporadic leafless development of either *O. gramineum* Willd. or *O. lusitanicum* L. (Lee 1944, Andrews in press). The species was described from New Ireland material and prior to the Northern Territory collections, the only Australian material was a few specimens gathered from near Ravenshoe, north Queensland in March 1943 (Lee 1944).

The local abundance of the species in parts of Arnhem Land enabled a comprehensive study to be carried out. The species is characterized by a tropophyll reduced to a linear appendage 1–2 mm long. The colonies studied in Arnhem Land showed a remarkable degree of uniformity and there is little doubt about the distinctiveness of the taxon. Reduced forms of *O. gramineum* and *O. lusitanicum* occur sporadically in other parts of Australia and the fertile specimens have a general similarity to *O. lineare*. Both species can be distinguished from *O. lineare* by the sterile plants which consist of a normal, leaf-like tropophyll. By contrast sterile plants of *O. lineare* consist of a slender common stalk and the reduced linear tropophyll.

In Arnhem Land *O. lineare* grows in seasonally inundated sand sheets between sandstone outcrops. The Queensland collection, is recorded as growing in black loam between grass tussocks.

**Northern Territory.** DARWIN AND GULF DISTRICTS: Katherine Gorge National Park, 14°20'S, 132°30'E Feb 1980, Dunlop 5229 (DNA); Lightning Dreaming, Arnhem Land, 12°55'S, 133°02'E, Feb 1984, Jones 1486 (DNA, BRI); 6 km S of Mt Gilruth, Arnhem Land, 13°10'S, 133°06'E, March 1984, Jones 1538 (DNA).

### Acknowledgements

The authors wish to thank Dr B. S. Parris and Professor R. E. Holttum of Royal Botanic Gardens, Kew, for identification of material and Gordon Guymier for assistance with the manuscript. We also thank Barbara Jones for processing the manuscript. The unstinting help and hospitality of Clyde Dunlop during Northern Territory field trips is gratefully acknowledged by David Jones.

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## STUDIES IN QUEENSLAND PANDANACEAE 1. A NEW SPECIES AND HYBRID OF *PANDANUS* L.f.

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### Summary

A species of *Pandanus* section *Austrokeura*, *P. yalna* R. Tucker and intersectional hybrid, *P. × nullumiae* R. Tucker are described from Cape York Peninsula and their distribution, relationships, ecology and ethnobotany discussed.

Australia has a rich assemblage of *Pandanus* and Cape York Peninsula, the large landmass at the extreme north of Queensland is a main centre of diversity of the genus. The species there and their relationships are poorly understood. The *Pandanus* of the high rainfall region centred around Iron Range and Lockhart River Aboriginal Community on north-eastern Cape York Peninsula were the subjects of a field study conducted by me from July 1981 to July 1982.

Many of the species there were known from pistillate material only, the genus being dioecious. Prime objectives were to collect staminate material, study the ontogeny, phenology, ecology and relationships of the various species and to record whatever ethnobotanical knowledge that remained amongst the people of the Aboriginal Community.

The people at Lockhart River represent two major dialectual groups and retain much of their traditional culture, technologies and language. I soon discovered that there was a wealth of ethnobotanical information to be gathered there. The people recognise plant genera and have names for most plants and understand the properties and uses of many. During the period I stayed there the Aboriginal Community conducted their traditional men's initiation, a sort of male secret society aimed at guiding the youths into manhood. I was invited to participate, an invitation I did not hesitate to accept and was duly adopted by a family in the community, so as to have the relatives necessary for the initiation process. The various relatives proved to be of great value, particularly with advice on *Pandanus* locations, distributions, technologies and terms. One relative from the 'Ngachi-kincha' (bora-law, = initiation process and its complex laws) is honoured in the name of the new hybrid described herein.

Ongoing studies into the ontogeny of the Lockhart River *Pandanus* are being conducted with live material cultivated in the indigenous-species Pandanetum at Anderson Park Botanic Gardens in Townsville, to augment data recorded in the field. Such data include that gained from the dissection of entire caulomeres (leaf-crowns) to better understand the sequence of leaf modification within the growth cycles. Due to the rhythmic terminal flowering the leaves are reduced to become bracts on the inflorescence peduncle with a new axillary shoot forming, firstly with prophylls, then leaves and finally flowering again. The position of the leaves on the caulomere relative to the peduncle can greatly influence leaf form and is a major consideration when studying herbarium material.

Staminate material was collected of all species present including one described herein. Certain insect pollinators were collected and records and collections made of numerous associated plants. The bulk of the material is at QRS with some duplicates at BRI and KLU.

Several important observations regarding *Pandanus* ontogeny and phenology were made and will be discussed below, however one may be briefly dealt with here. Some authors, particularly Stone (pers. comm.), have noted that many species of *Pandanus* display sexual dimorphism in the extent of branching. Male trees are often more richly branched than females, the reason for this being unclear but a possible higher frequency of flowering in males (e.g. more opportunity to branch) is implied. From my observations it seems that female and male trees generally flower synchronously only once annually and that females are often carrying mature fruit when the next flowering begins. Possibly,

in terms of biomass production, the females cannot afford the rich vegetative growth of the males which produce comparatively small and ephemeral flowers. It is also possible that having fewer branches is advantageous for seed production; *Pandanus* has no ability to enlarge the stem diameter with added branching, hence additional branches become smaller and unable to support large fruits with a high carpel number. Richly branched females may be able to produce many fruit but the reproductive potential would probably be greatly reduced as carpel number per syncarp and seed size were reduced.

*Pandanus* generally are not closely comparable to other monocotyledonous trees and present certain problems when their structures are studied. It is often difficult to find suitable terms for some of their parts; however, an attempt has been made here to use those which are now somewhat standardised. For convenience a few important terms are listed as follows:

- prop-root –any above-ground primary root
- pneumatophore –specialised secondary roots growing vertically from primary roots above and below ground allowing gaseous exchange
- stolon –any creeping and rooting axillary shoot being a means of vegetative propagation
- phalange –a group of united carpels within the syncarp
- staminal phalange –a group of stamens united on a common filament

***Pandanus yalna* R. Tucker, sp. nov.** affinis *P. solms-laubachii* Warb. a quo distinguitur foliis latoribus nitidioribus, pericarpio eduli flavo et phalangibus apicalibus instructus pluribus carpellis. **Typus:** Cook District: Tozer's Gap, 22 Jan 1982, *Tucker 328* (pistillate) (holotypus QRS).

Trees erect, 10(–20) m high, much branched above, branches alternate or whorled. Trunk to 8 m high, 40–100 cm basal diam., with few to many stolons, prop-roots few to numerous, 100 cm × 3 cm, densely clothed with numerous erect, adventitious rootlets at the base, those on the roots become functional pneumatophores up to 40 cm high. Bark greyish-brown, leaf-scars indistinct. Branches semi-erect, ascending to 10 m, bark greyish-brown, fissured, leaf-scars conspicuous, each bearing an adventitious axillary shoot to 4 mm diam. Leaves in the terminal rosettes semi-erect, arching from the base, bending midway, on juveniles to 3 m × 10 cm, adults usually narrower and shorter to 2 m × 6–8 cm, linear, acuminate with a fine subulate apex, coriaceous, margins and abaxial midrib dentate, upper surface semi-glossy mid-green, paler and semi-glaucous beneath with a glossy brown area at the base. The base with a shallow, rounded keel, margins entire for 13 cm from base, above which the prickles antrorse, 1–3 mm long, 1 cm apart, white with a darker greenish-brown tip, the midrib beneath unarmed. At mid-section the leaf has a shallow, usually asymmetric keel, the laminas ± drooping towards the margins where the antrorse prickles 1–2 mm long, 5–10 mm apart, the midrib beneath with a few scattered prickles 1–3 mm long, 5–10 mm apart, all antrorse or rarely a few retrorse. Towards the apex the leaf with a shallow keel, the margins ascending with antrorse prickles 1 mm long, 1–4 mm apart, prickles on midrib below similar and becoming smaller and closer towards the apex. Syncarp terminal, horizontal or rarely semi-pendulous, pedunculate, bracteate, ovoid-spherical, subtrigonal, to 25 cm × 21 cm, phalanges 110–127, multicarpellate. Peduncle to 20 cm × 25 mm, trigonous with ± 9 bracts, the lowermost green, foliaceous, to 127 cm long, the uppermost dry, variously eroded, black or brown. Phalanges with 10–31 carpels, highest numbers usually near apex, 55–60 mm × 15–50 mm, tapered towards the base, the apex ± truncate, widest point 10–15 mm from apex, the upper surfaces papillose, the lower surfaces ± smooth, the whole with numerous longitudinal, angular sulci extending from just below the carpel apex to just above the base. Carpel apices conic-pyramidal, to 10 mm high, the peripheral carpels with variously flattened apices. Stigmas vertical to oblique, linear to caudate, dark brown to black. When ripe the upper part of phalange dark orange to brown, the lower portion bright yellow to orange-yellow. Pericarp fibrous, the upper part vaulted, the fibres embedded in a mass of spongy aerenchyma, the lower part succulent and edible. Endocarp median, dark brown, bony. Seeds median, cylindrical with tapered ends, 10–22 mm × 1.5–2 mm, white, edible. Staminate inflorescence terminal, semi-pendulous, often supported by the leaves, pedunculate, bracteate, to 100 cm long. Peduncle 10–16 cm × 15 mm, white, trigonous. Rachis to 52 cm long, with tristichous ranks of 24–30 bracts, each subtending a staminate branch, the lowermost bracts to 175 cm long,

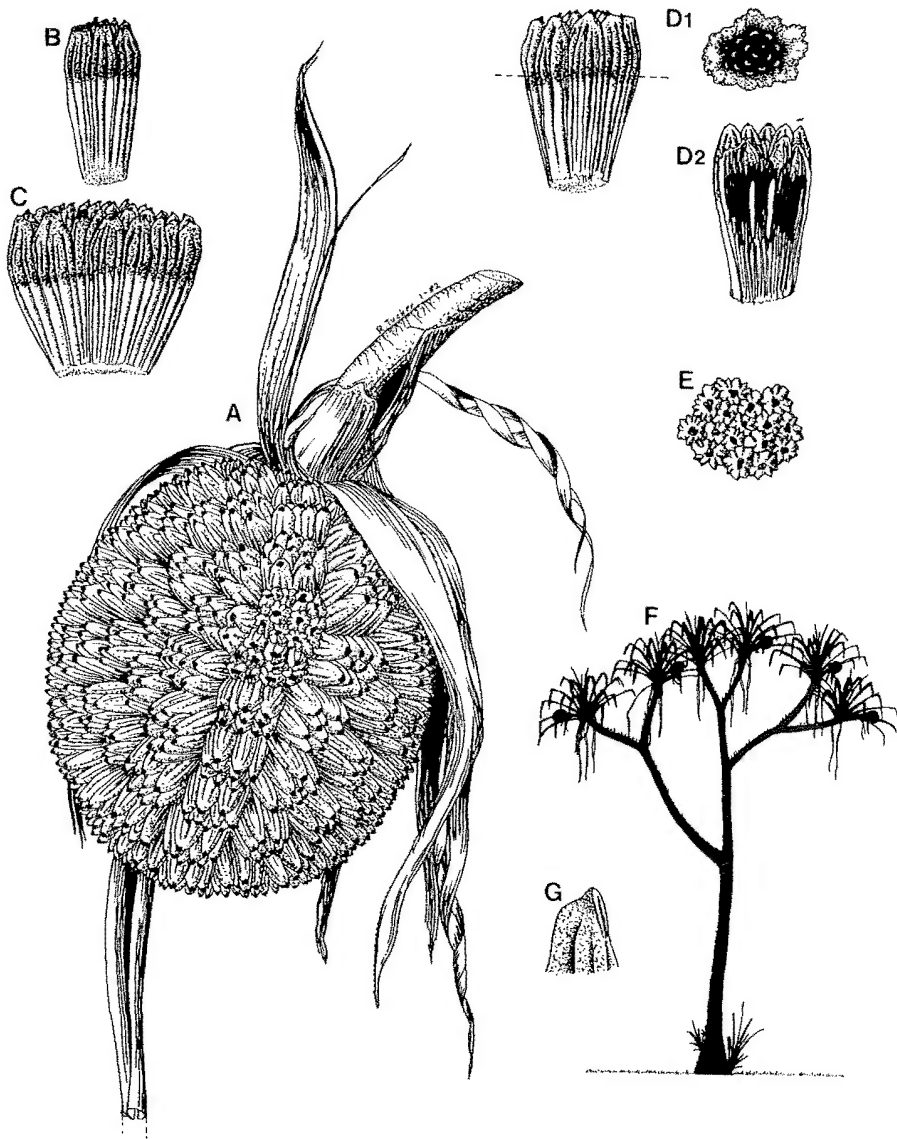


Fig. 1. *Pandanus yalna*: A. syncarp  $\times 1/4$ . B. few-carpellate phalange  $\times 1/2$ . C. multicarpellate phalange  $\times 1/2$ . D1, phalange in transverse section  $\times 1/2$ ; D2, phalange in longitudinal section  $\times 1/2$ . E. phalange from above  $\times 1/2$ . F. carpel apex and stigma  $\times 21/2$ . G. habit of pistillate tree  $\times 1/100$ .



finely dentate along margins and midrib, white, soft, caducous, decreasing in length and width towards inflorescence apex. Staminal branches to 12 cm long, with numerous staminal phalanges to 25 mm long, those near the rachis longest, a few with a narrow bracteole to 25 mm  $\times$  3 mm, minutely dentate along the margins. Stamens numerous, filaments 4 mm  $\times$  1 mm, anthers 5–6 mm long, terminated by a fine apiculus to 1 mm long. Figs 1–3.

**Distribution:** North-eastern Cape York Peninsula, on the coastal lowlands and ranges to the western slopes of the Great Dividing Ra. to at least 350 m alt., from just south of Coen (14°10'S, 143°14'E) to the Dulhunty River (11°49'S, 142°29'E) with a small outlying occurrence near Batavia Landing (12°11'S, 141°56'E) on the lower reaches of the Wenlock River in north-western Cape York Peninsula.

**Queensland.** COOK DISTRICT: Tozer's Gap, 22 Jan 1982, *Tucker* 327 (staminate) (BRI, QRS); same location & date, *Tucker* 328 (holotype) (QRS).

**Etymology:** The specific epithet comes from the Lockhart River Kuuku-ya'u and Uutalnganu dialects names for this plant: 'Yaln-a'.

**Relationships:** *P. yalna* is closely related to *P. solms-laubachii* the type of *Pandanus* section and series *Austrokeura*. Section *Austrokeura* B. Stone as circumscribed by Stone (1978) is represented in Australia by the series *Austrokeura* B. Stone and *Spirales* B. Stone, which he considered had two morphological and geographical/environmental extremes. Differences between the series are summarised in Table 1.

**Table 1.** Comparison of series *Austrokeura* and *Spirales*.

|                      | <i>Austrokeura</i>                             | <i>Spirales</i>                                   |
|----------------------|--|---|
| adult leaf dentation | $\pm$ dentate throughout                       | $\pm$ entire                                      |
| phalange             | elongate, many carpels, sulcate, red to yellow | rotund, few carpels, $\pm$ smooth, reddish        |
| carpel apex          | pyramidal                                      | oblate to low conic                               |
| distribution         | eastern Queensland                             | western Cape York Peninsula, N.T. & northern W.A. |
| habitat              | moist savanna to swampforest                   | seasonally dry savanna                            |

Intermediates between the series do occur particularly in areas that combine dry savanna and permanently moist swamps and swamp forest, as in parts of eastern coastal Queensland, Cape York Peninsula and the northern Northern Territory. Stone (1978) suggests a possible 'hybrid belt' bridging the two series, so great is the mixing of characteristics in some regions. Generally, however, there is a conspicuous conformity to the morphology of the series within their respective regions. Section *Austrokeura* occurs over most of northern Australia and extends into New Guinea and nearby Moluccan islands.

*P. solms-laubachii* occurs on the coastal lowlands and ranges from about Ingham (18° 45'S, 146° 10'E) to Cooktown (15° 20'S, 145° 10'E) and extends on to the lower tablelands to at least 600 m alt. It is variable and numerous described species have been referred to it (Stone, 1974). Some combine features of series *Spirales*; for example, red pericarp, low conic carpel-apices, reduced carpel number and variable adult leaf dentation ranging from partially entire throughout to entire on one margin. It is frequently found growing in open sites along seasonal watercourses and rarely in deep, permanent water. The leaves tend to be somewhat glaucous, straight and not arching, the pericarp hardly edible and basal stolons variable but sometimes up to 10 m long.

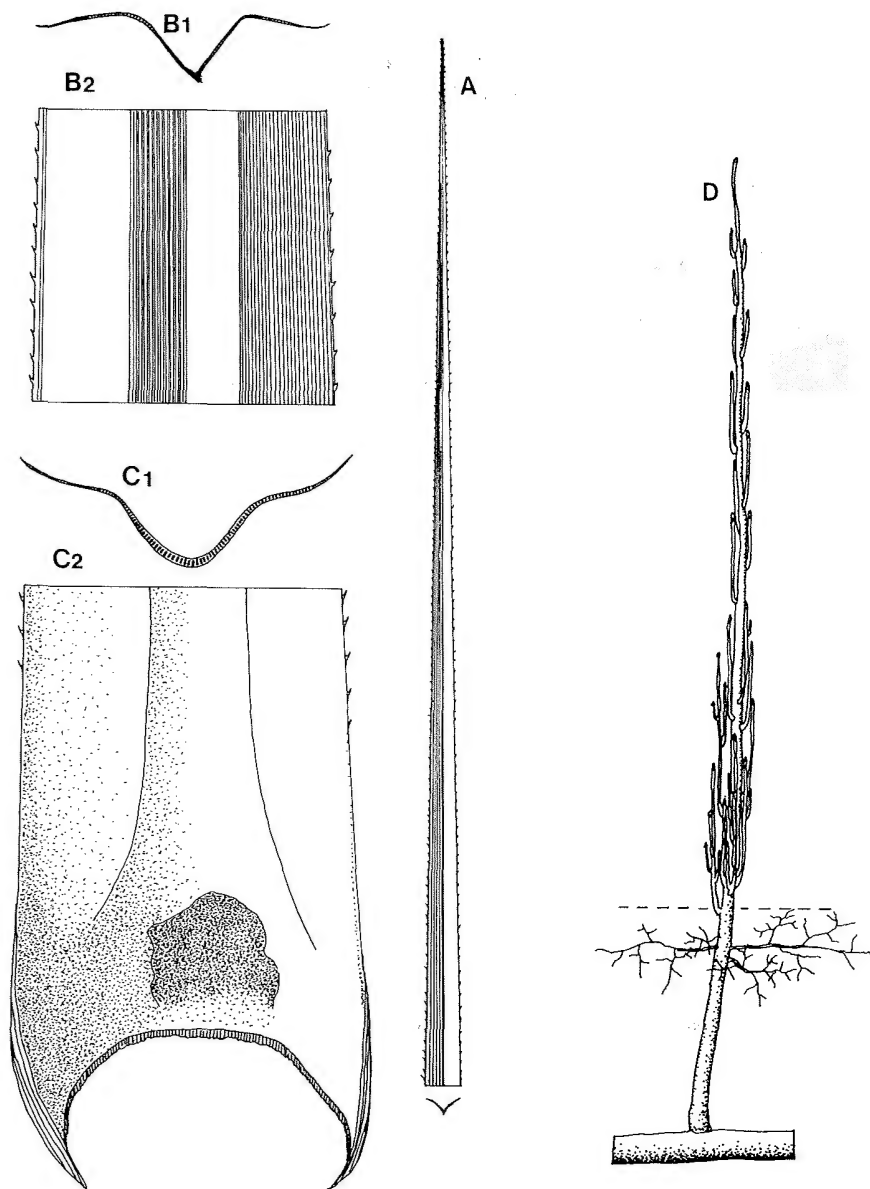
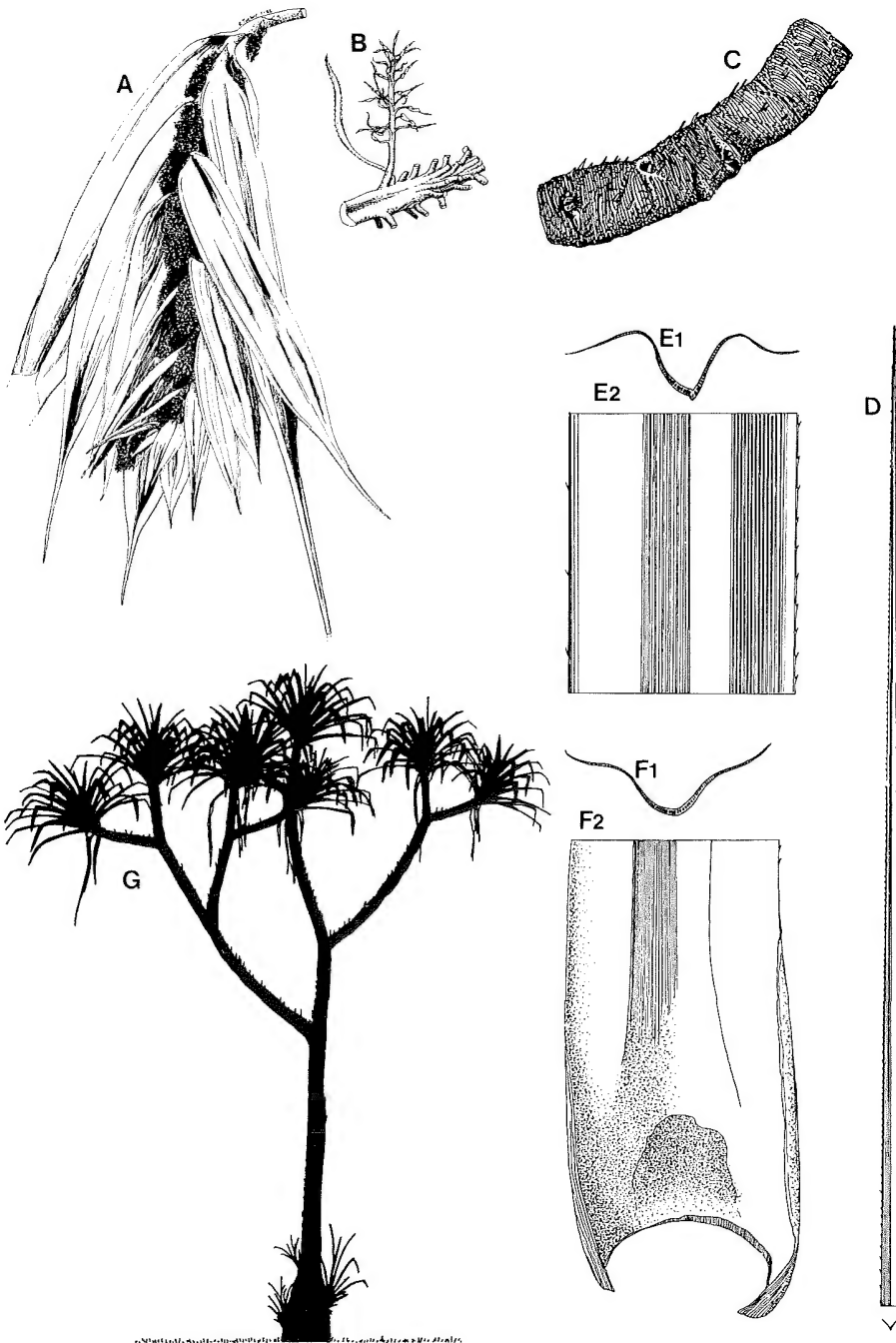


Fig. 2. *Pandanus yalna*: Pistillate leaf. A. leaf apex and transverse section  $\times 1/2$ . B. leaf mid-region  $\times 1/2$ ; B1, in transverse section; B2, from above. C. leaf base  $\times 1/2$ ; C1, in transverse section; C2, from above. D. pneumatophore  $\times 1/3$ .



**Fig. 3.** *Pandanus yalna*: Staminate plant. A. inflorescence  $\times 1/6$ . B. branch with bracteole and phalange  $\times 1$ . C. detail of branch  $\times 1/6$ . D. leaf apex and transverse section  $\times 1/3$ . E. leaf mid-region  $\times 1/3$ ; E1 transverse section; E2, from above. F. leaf base  $\times 1/3$ ; F1, transverse section; F2, from above. G. habit of tree  $\times 1/60$ .

By contrast *P. yalna* is uniform throughout its range, has arching, broader, glossier leaves and edible yellow to orange-yellow pericarp. It always grows in sites which are permanently moist or wet, sometimes in very deep water (to 1.5 m) which becomes rather acidic at the end of the dry season. Vegetation types range from sedge/fern swamps through to broadleaf swampforest, riverine gallery forests and mangrove margins, rarely littoral strand around freshwater soaks, rainforest and (brackish) mangroves. This species also displays a higher degree of sexual dimorphism than does *P. solms-laubachii*. The males are often shorter and more richly branched, the branches being equal axillary pairs, resembling dichotomies, whereas in *P. solms-laubachii* it is mostly difficult to distinguish the sexes without fruit or inflorescence evidence.

*P. yalna* juveniles often produce leafy stolons from the lower axillary buds, particularly when growing in deep water in an open situation. These stolons grow down to the soil/water level and become repent for up to 2 m, then grow into trees similar to, but often larger than, the parent. In shady sites the trees can grow to 20 m and are usually single-stemmed, although they produce a few leafy shoots on the lower 3 m of trunk. Figs 1G, 3G. With its semi-glossy, broad and arching leaves and preference for shaded, wet sites, *P. yalna* is unique amongst members of section *Austrokeura* and appears to be primitive, its relatives being, for the most part, well adapted to life in seasonal savannas where they tolerate regular burning and droughts. Such a habitat is possibly only recently exploited by *Pandanus*, the bulk of species of which are rainforest plants.

The fruits are distributed by water and various animals (flying-foxes, birds, rats, etc.) and the pollen is insect distributed with wind playing a doubtful role. The trees generally grow in such sheltered situations that air movement around the leaf crowns sufficient to carry pollen to adjacent females would be greatly limited. At anthesis the inflorescences are distinctly hot and produce a strong scent. Inflorescence temperature elevation and its bearing on scent production and pollination in *Pandanus* is a new area of study and more detailed mention will be made of it in a separate section below.

**Ethnobotany:** In the Lockhart River region *P. yalna* is abundant and was formerly of some importance to the local Aboriginal people. Here all *Pandanus* come under the generic name "Tangka" and each has a particular name. The 'mai' (fruits) of 'Yalna' were eagerly sought when ripe, the older people recruiting young boys to climb the tall trees. The fruit and entire leaf-crown were harvested. The soft basal part of the pericarp was eaten raw, having little calcium oxalate, unlike fruits of other species of section *Austrokeura*. The tender growing point and young leaves were eaten raw, being similar to palm 'cabbage'. The fruits have an unusual scent, like soap and ripe pineapple together, but the taste is far from unpleasant, being more like oily pineapple with a very faint suggestion of starch.

The leaves are still occasionally harvested and after removal of the 'aka' (marginal prickles and midrib) are cut into thin strips, dried and woven to make the 'urrkutu', a headband worn by the young men during the final ceremony of their initiation. *P. zea* St. John ('Kaku-lamu') is the preferred species for this purpose but the leaves of *P. yalna* are used when the former is unavailable.

In October 1980 I observed a very distinctive and handsome *Pandanus* growing near Wachi (creek) in the Lockhart River Aboriginal Reserve (12° 49'S, 143° 20'E). This tree, although sterile, exhibited characteristics of sections *Austrokeura* and *Australibrassia* St. John. It was revisited in August 1981, and another similar tree located nearby. Another sterile tree was located 20 km away at Quintel Beach (12° 48'S, 143° 30'E) in December 1981. In May a fertile pistillate tree of this taxon was discovered near the Lockhart River Aboriginal Community. Its fruit morphology was intermediate between that of the putative parental sections. It is here named *P. × nullumiae* R. Tucker. It is the first hybrid in the genus to be formally described.

The recognition of an intersectional hybrid raises the question as to whether or not the putative parental sections deserve sectional as opposed to subsectional status. *Austrokeura* was raised to its present position from subsectional level within *Pandanus* on the basis of the distinctive morphology of this group (Stone 1978) while *Australibrassia* was originally afforded sectional status within a totally different infrageneric classification

system (St John 1960). However, recent field studies have indicated that section *Australibrassia* is not clearly defined. I expect further studies will support the reduction of *Austrokeura* and *Australibrassia* to subsectional level within section *Pandanus*.

***Pandanus* × *nullumiae*** R. Tucker, hybrida naturalis inter *P. yalna* R. Tucker et *P. conicum* St. John ab illo statura parviore, paucioribus radicellis in trunco et radicibus et ramis, foliis angustioribus, syncarpio pendulo, phalangibus paucioribus et seminibus paucioribus sed latoribus, a hoc amplioribus, pluribus longioribus erectis radicellis in trunco et radicibus et ramis, latoribus pallentibus phalangibus pluribus paginis sulcatis et seminis angustioribus differt. **Typus:** COOK DISTRICT: Lockhart River Aboriginal Reserve, Unchi Creek, 19 May 1982, *Tucker 376* (holotypus QRS).

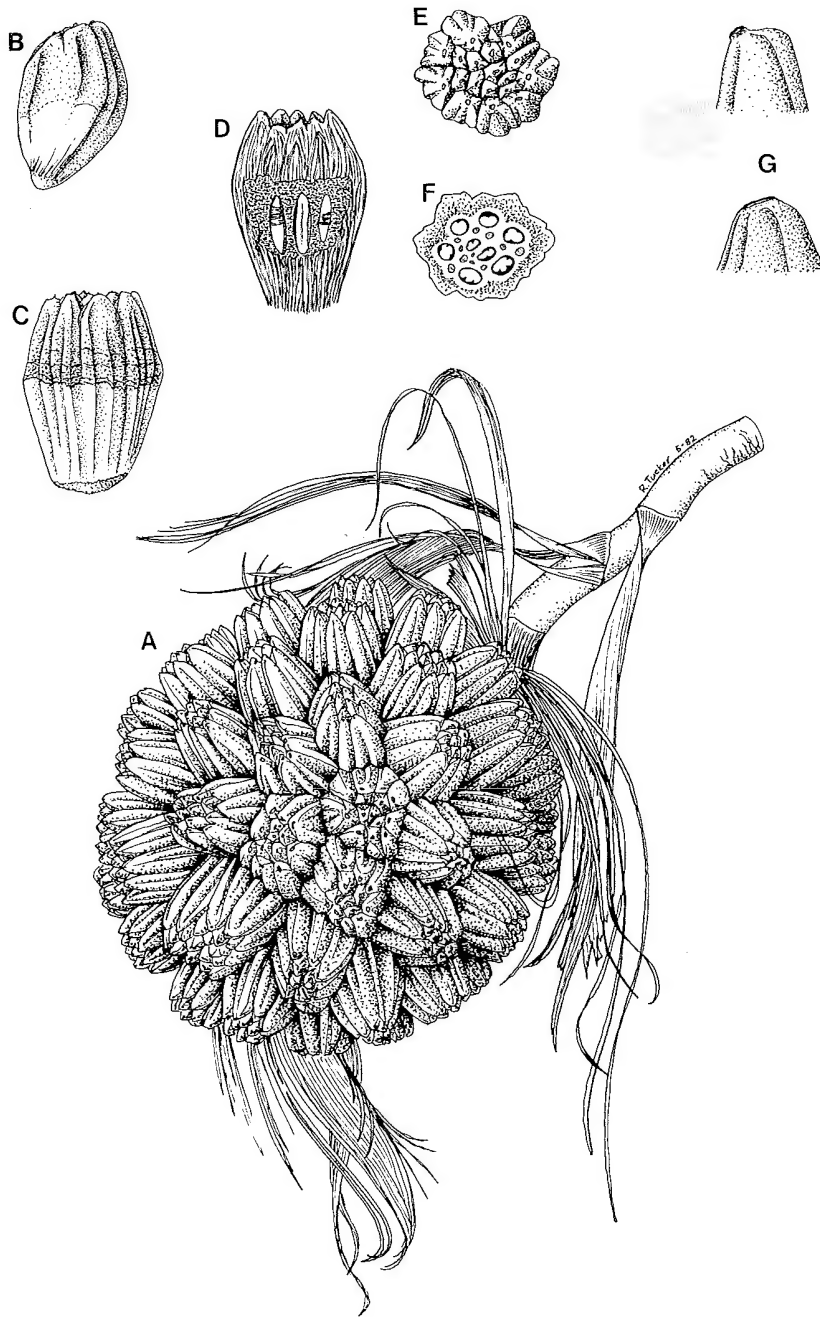
Trees erect or leaning, 8(–10) m high, little to much branched above, branches whorled. Trunk 4 m × 20 cm, rarely with a few adventitious stolons near the base, prop-roots few to numerous, 35 cm × 3–5 cm, with longitudinal rows of short prickles-like to erect, linear adventitious rootlets, bark grey to brown with scattered erect rootlets, leaf-scars indistinct. Branches spreading to ascending, to 6 m long, bark tan-brown to grey, leaf-scars conspicuous, each bearing an axillary adventitious shoot 3–4 mm diam. Leaves in terminal rosettes, to 2 m × 5 cm, arching from the base, bent about midway, linear, acuminate with a fine subulate apex, coriaceous, margins and midrib beneath dentate, upper surface semi-glossy mid-green, paler and semi-glaucous beneath with a pale brown area at base, the base with a shallow keel, 75 mm wide, margins ascending, basal 5–12 cm entire, then with antrorse prickles 1–2 mm long, 7–10 mm apart, at midway the leaf with a shallow keel, asymmetric, 5 cm wide, the laminae ± drooping towards the margins where the antrorse prickles 1–2 mm long, 7–15 mm apart, a few retrorse, 30 cm below the apex, the leaf 1 cm wide, keeled, margins and midrib with antrorse prickles 0.5–1 mm long, 2–4 mm apart. Syncarp terminal, pendulous, pedunculate, bracteate, spherical, 17 cm diam., phalanges 65, multicarpellate. Peduncle 30 cm × 2 cm, trigonous, bracts to 35 cm long, eroded, dry, dark brown to black. Phalanges 40–50 mm × 25–35 mm, widest about the middle, base and apex ± truncate, in cross-section ± hexagonal, carpels 5–15, minutely papillose above, smooth below, the whole with numerous shallow longitudinal sulci. Carpel apices pyramidal, stigma terminal, horizontal to oblique, linear to circular, 1.5–2 mm long. Pericarp fibrous, lower part succulent, endocarp median, dark brown, bony, seeds median, fusiform to cylindric, 10–15 mm × 3–4 mm. Receptacle ovoid, 75 mm long, with acute apiculum. Male inflorescence unknown. **Figs 4 & 5.**

**Distribution:** The hybrid is known from only three locations, all within the Lockhart River Aboriginal Reserve. However, it is expected that further locations will be discovered in the vicinity of Lockhart River and perhaps other parts of north-eastern Cape York Peninsula.

**Etymology:** The epithet of the hybrid honours Mrs Nullum Marrott, of Lockhart River Aboriginal Community, custodian of the women's ceremonial culture (in particular the women's dances performed during initiation rites) for her support as 'Paapa-muka' (ceremonial and substitute mother) during my initiation and for her advice regarding *Pandanus* locations.

That *P. × nullumiae* is a hybrid between *P. yalna* and *P. conicus* is indicated by its intermediate morphology and association with the putative parents, a comparison of which is summarised in **Table 2**.

*P. conicus* is a widespread, variable species occurring over much of the range of *P. yalna* from its southern limit extending north to Cape York. It is common and gregarious in littoral closed forests, brackish riverine gallery forests, on mangrove margins, and in almost any situation that excludes highly competitive climbers such as *Calamus*. Because of this wide ecological amplitude it is frequently associated with other species of *Pandanus*. It does not occur, however, in dense rainforest, on sites subjected to regular burning, and in open swamps and deep water. Because it is absent from water, it rarely forms an association with *P. yalna*. In the few locations where it has been observed with *P. yalna* it occurs in rather broad ecotones between gallery forest and semi-deciduous vine forest, swampforest and littoral closed forests and between gallery forest and heath.



**Fig. 4.** *Pandanus*  $\times$  *nullumiae*. A. syncarp  $\times$  1/3. B. basal phalange. C. median phalange  $\times$  1/2. D. phalange in longitudinal section  $\times$  1/2. E. phalange from above  $\times$  1/2. F. phalange in median transverse section  $\times$  1/2. G. carpel apices and stigmas  $\times$  3.

Table 2. Comparison of *P. yalna*, *P. × nullumiae* and *P. conicus*.

|                           | <i>P. yalna</i>                              | <i>P. × nullumiae</i>                 | <i>P. conicus</i>        |
|---------------------------|--|---------------------------------------|--------------------------|
| leaf colour               | mid-green                                    | mid-green                             | dark to mid-green        |
| leaf length/breadth ratio | 1:27   | 1:40                                  | 1:56                     |
| syncarp habit             | horizontal                                   | pendulous                             | pendulous                |
| phalange no.              | 110–127                                      | 65                                    | ± 20                     |
| apex                      | papillose, broad                             | minutely papillose, gathered          | smooth, crowded          |
| stigma                    | vertical to oblique                          | oblique to horizontal                 | verticle to horizontal   |
| seed                      | cylindric, ends tapered, 10–22 mm × 1.5–2 mm | fusiform cylindric, 10–15 mm × 3–4 mm | ovoid, 10–15 mm × 5–7 mm |
| receptacle apex           | truncate                                     | acute                                 | acuminate                |

Because of the long peduncle, as in *P. conicus*, the syncarp of *P. × nullumiae* hangs below the leaves. In *P. yalna* the peduncle is short, so the syncarp is supported by the leaves. The peduncle of *P. conicus* is disproportionately long compared to other species of subgenus *Pandanus* in Australia.

The short adventitious rootlets on the prop-roots, trunk and branches of various species of subgenus *Pandanus* are distinctive enough to be of diagnostic importance at sectional level. Species of section *Austrokeura* usually have erect, narrow and rather pliable rootlets in varying densities, depending on environment and age of the tree. Trees at very wet sites or in high rainfall zones often have extremely dense and long rootlets. These often form in the axils of extant leaves and can grow through the bases as the leaves die and decay, preventing the fibrous remains of the leaves from falling away entirely. This results in the 'shaggy' appearance of *P. yalna*, especially when this covering is colonised by epiphytes. In members of section *Australibrassia* the rootlets are usually short and conical with extremely pungent apices, functioning more like prickles and apparently not adapted to gas exchange or moisture intake as in members of sections *Austrokeura* Fig. 2.

In *P. × nullumiae* the adventitious rootlets are intermediate in form between these types, being somewhat erect but short and hard, with expanded or bulbous bases. A few may approach either parental type but most are intermediate. A small amount of leaf fibre may persist on the lower trunk, held in place by the adventitious rootlets, but the trunk is generally clear of such material and as a result is usually free of epiphytes.

**Hybridity:** Hybrids of *Pandanus* have not been formally described previously and little has been mentioned on the subject in the literature (Stone 1976, 1982a). It appears that most pandan-rich areas contain species which retain their genetic integrity through barriers such as ecological isolation and differences in flowering time. However, north-eastern Cape York Peninsula offers much potential for hybridisation.

In general the topography is varied but with an extremely narrow altitudinal range and the climate is relatively uniform. Most species are confined to particular habitats but it is always possible to find certain locations which accommodate a number of species together and then they are usually from different subgenera. Of the three subgenera present in the Lockhart River area, subgenus *Pandanus* is the only one with more than one species.

The potential for hybridisation between various species of *Pandanus* in the Lockhart River area was clearly evident. Prior to my stay there, the staminate plants of all species except *P. zea* (subgenus *Lophostigma*) and *P. tectorius* Parkinson ex Z. (subgenus *Pandanus*) and their flowering times were unknown. Beginning in December

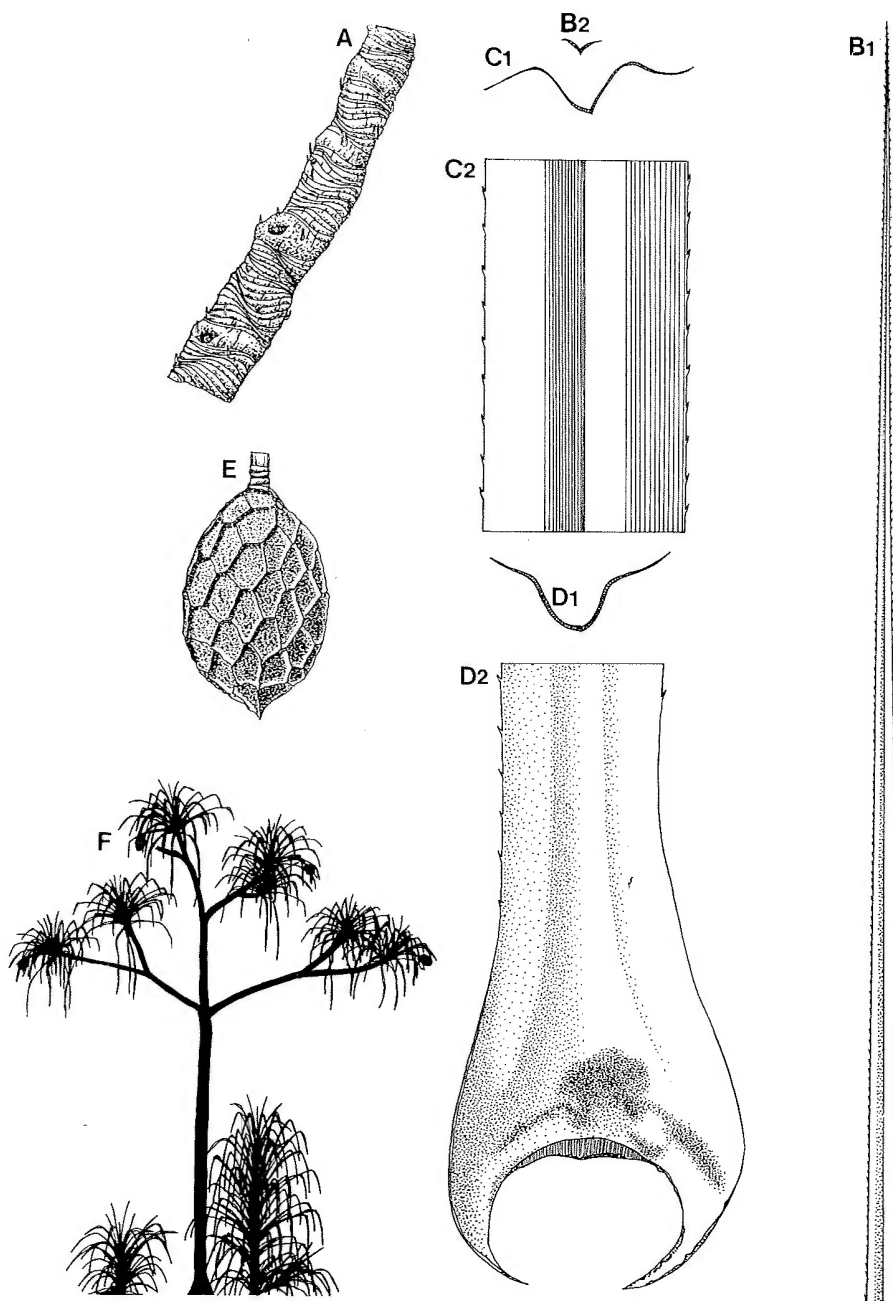


Fig. 5. *Pandanus*  $\times$  *nullumiae*. A. detail branch  $\times 1/6$ . B. leaf apex  $\times 1/2$ ; B1, from above; B2, transverse section. C. leaf mid-region  $\times 1/2$ ; C1, transverse section; C2, from above. D. leaf-base  $\times 1/2$ ; D1, transverse section; D2, from above. E. receptacle  $\times 1/3$ . F. habit of pistillate trees  $\times 1/140$ .



1981, various populations in the area around Lockhart River were monitored until flowering began. All species of subgenus *Pandanus* flowered synchronously over a four week period, commencing in late January 1982, although *P. tectorius* flowered from December to March it peaked during the same few weeks.

Very little is known of the phenology of the genus as a whole, but observations of wild plants indicate that a single, short flowering period during the rainy season is common, at least to species in subgenus *Pandanus*. Cultivated plants behave somewhat differently and are probably unreliable as indicators of the flowering cycles of their wild counterparts, particularly when conditions diminish the effect of climatic seasonality.

Whilst observing and collecting staminate and pistillate inflorescences, particularly those at anthesis, I discovered various insects which are possible pollen vectors. These insects were present on the staminate inflorescences of all *Pandanus* species (regardless of subgenus or section) in the study area. They include native and introduced bees, large Scarabid beetles and small Nitidulid beetles. Some of these were collected for positive determination. Of these only the Nitidulid beetles were frequent on flowering syncarps.

There is scant information about pollinators of *Pandanus*. It has been assumed that wind plays an important role in the pollination of species from exposed habitats, such as savanna, along river banks and on the littoral strand (Stone 1982b). Evidence obtained at Lockhart River during the course of the study indicates that such wind pollination may not be the case at all. All *Pandanus* species were found to have some degree of temperature elevation of the staminate inflorescence, both staminate and pistillate inflorescences emitted strong and similar scents and pistillate inflorescences exhibited nectar secretion in minute quantities on and around the stigmas. *P. tectorius*, a species of the littoral strand and dunes, exhibited inflorescence temperature elevation, scent emission and nectar secretion on both staminate and pistillate inflorescences.

Inflorescence temperature elevation has been recorded in certain families, notably Arecaceae and Araceae, and is thought to be related to stages of floral development and perhaps pollen shedding and stigmatic receptivity (Schroeder 1978), whilst scent and nectar production are doubtlessly adaptations to faunal pollinators. Possibly, inflorescence temperature elevation is a means of dispersing scents derived from volatile essential oils produced prior to and during anthesis. Some species are rich in such oils and are tended and cultivated in some countries as a source of perfume. In India there exists a locally important industry based on cultivars of *P. odoratissimus* L.f. (subgenus *Pandanus*), a species which is closely related to, and in some ways difficult to separate from, *P. tectorius*. The inflorescences are gathered from cultivated male trees and the essential oil extracted as a perfume base (Purseglove 1972).

Unfortunately I had not anticipated the temperature elevation of *Pandanus* inflorescences and had no means of measuring it in the field. The temperature of staminate inflorescences of *P. tectorius*, in one instance, continued to rise after they were collected and treated with alcohol as a preservative, to the extent that I thought they might cook themselves. Perhaps the high temperature of the specimens was caused by their treatment. In any case I was alarmed at the heat generated inside the package of duplicates and unpacked them in attempt to cool them down. The chemistry and mechanics involved with this phenomenon warrant further study.

During the peak flowering period of *Pandanus* at Lockhart River, the absence of wind was noticeable. At this time of the year (January to late February) the north-west monsoon was entrenched and the Great Divide acted as a barrier to air movement from interior parts of Cape York Peninsula. By contrast the dry-season (south-east monsoon) commencing every May or June and lasting until December, is a time of constant south-east winds and almost no flower production amongst the *Pandanus* populations. From the available evidence it seems that the Lockhart River *Pandanus* are adapted to faunal pollinators during a period when wind (as a pollen dispersal agent) would be unreliable. There is no reason to suppose that Lockhart River is unique in this way, but knowledge of *Pandanus* phenology and pollination in most other parts occupied by the genus is lacking or at best very poor and will require much field work to remedy.

Allowing for the factors outlined above, it is odd that hybrid *Pandanus* are not more abundant on north-eastern Cape York Peninsula. However, the narrow ecological amplitude of some species is probably a sufficient barrier to hybridisation over much of their distribution.

### Acknowledgements

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## **PROTASPARAGUS AFRICANUS (ASPARAGACEAE) A SERIOUS WEED FOR SOUTH-EASTERN QUEENSLAND**

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### **Summary**

*Protasparagus africanus*, an introduced weed from South Africa, is described and figured. Notes on its distribution and ecology are given with a key to the naturalised taxa of the Asparagaceae in Australia. The new combination *Protasparagus densiflorus* cv. *Sprengeri* is made based on *Asparagus sprengeri* Regel.

Since the early 1970's, specimens of the Southern African *Protasparagus africanus* (Lam.) Oberm. (Asparagaceae) have accumulated in Queensland herbaria. Introduced as a garden ornamental, this may be the plant mentioned by Bailey (1909) as *Asparagus racemosus* Willd. (= *Protasparagus racemosus* (Willd.) Oberm.) as 'A very troublesome weed', although it is possible that he was referring to the native *P. racemosus* (Willd.) Oberm. *P. africanus* has now become naturalised in a number of localities in south-eastern Queensland. **Fig.1.**

Obermeyer (1983, 1984) considered that the species referred to *Asparagus* by Baker (1875) and Jessop (1966) were better considered as belonging to three separate genera. This approach has been followed by Clifford & Conran (1986). A total of nine species of the Asparagaceae are found in Australia, *Asparagus* (1), *Myrsiphyllum* (3) and *Protasparagus* (5), but only *P. racemosus* is native. The naturalised species occur in eastern or southern Australia, with *M. asparagoides* (L.) Willd. also in Western Australia.

Other species, many with distinctive horticultural forms, are commonly cultivated and further naturalisations may occur. Huttleston (1970) reinstated the distinctive horticultural form of *A. densiflorus* (Kunth.) Jessop, previously known as *A. sprengeri*, as a cultivar he named *A. densiflorus* cv. *Sprengeri*. As this now belongs in *Protasparagus*, a new combination for this cultivar is made here.

***Protasparagus densiflorus* cv. *Sprengeri* (Regal) Conran & P. Forster, **comb. nov.****

*Asparagus sprengeri* Regel., Act. Hort. Petrop. 11: 302 (1890). **Type:** described from a cultivated specimen from Durban, fide Jessop (1966) n.v.

The naturalised species of the Asparagaceae in Australia are distinguished by the following key. Apart from *P. africanus*, only *Myrsiphyllum asparagoides* is regarded as a serious weed, while the other species keyed are only minor garden escapes.

- |  |   |
|--|---|
| 1. Flowers unisexual . . . . .                                 | <b><i>Asparagus officinalis</i> L.</b>            |
| Flowers hermaphrodite . . . . .                                | 2   |
| 2. Aerial stems annual . . . . .                               | 3   |
| Aerial stems perennial . . . . .                               | 5   |
| 3. Fruit pale bluish-grey . . . . .                            | <b><i>Myrsiphyllum declinatum</i> (L.) Oberm.</b> |
| Fruit red . . . . .  | 4   |
| 4. Cladodes single at leaf axils, broadly lanceolate . . . . . | <b><i>M. asparagoides</i></b>                     |
| Cladodes 3 per leaf axil, narrowly lanceolate . . . . .        | <b><i>M. scandens</i> (Thunb.) Oberm.</b>         |
| 5. Inflorescences racemose . . . . .                           | 6   |
| Inflorescences not racemose . . . . .                          | 7   |

6. Cladodes flattened . . . . . **Protasparagus densiflorus** (Kunth.) Oberm.  
 Cladodes subulate . . . . . **P. racemosus**  
 7. Plants not climbing, spines absent . . . . . **P. virgatus** (Baker) Oberm.  
 Plants climbing, spines present . . . . . 8  
 8. Berries black; flowers few, terminal . . . . . **P. plumosus** (Baker) Oberm.  
 Berries orange-red; flowers numerous, axillary . . . . . **P. africanus**

Three species, *M. asparagoides* (as *A. asparagoides* (L.) Wight), *P. densiflorus* (as *A. densiflorus* (Kunth) Jessop) and *P. plumosus* (as *A. setaceus* (Kunth.) Jessop) are also recorded as naturalised on Lord Howe Island (Rodd & Pickard 1983).

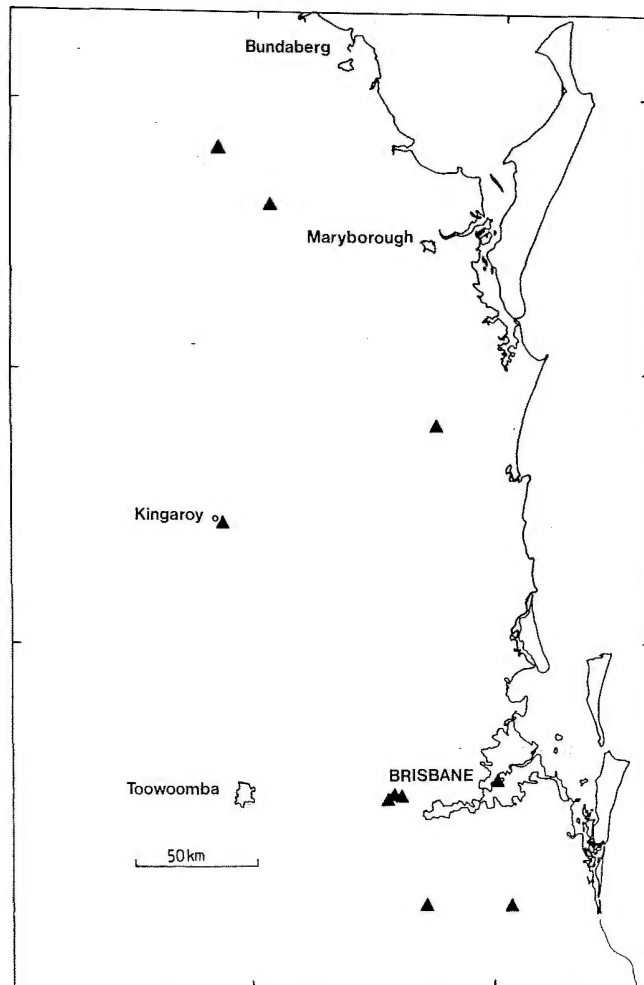


Fig. 1. Distribution of *Protasparagus africanus* based on herbarium specimens.

**Protasparagus africanus** (Lam.) Oberm., S. Afr. J. Bot. 2: 243 (1983). *Asparagus africanus* Lam., Encyl. 1: 295 (1783). **Type:** Cape Province without precise locality, *Sonnerat* s.n. (P) *n.v.*

Vigorous, fibrous rooted, rhizomatous, woody-stemmed climber to 3–5 m high. Cladodes numerous, in fascicles, 8–15 mm long, ascending, arcuately curved, subulate to flattened. Axillary spines well developed, to 15 mm long. Stems to 10 mm diam., longitudinally striate, dark reddish-brown. Flowers axillary, rarely terminal, few to numerous per axil, 5–7 mm diam., white. Pedicels 2–3 mm long, pericladium 3–7 mm long. Tepals 2.5–4 mm long, 1–2 mm wide. Stamens 2.5–3.5 mm long; filaments  $\pm$  erect, 1.5–3 mm long; anthers 5 mm long, yellow. Ovary ovoid to globose, 1–2 mm long; style capitate to minutely trifid, ca 1 mm long. Fruit a berry, 5–6 mm diam., bright orange-red, single-seeded. Seed globose, 3–4 mm diam., shiny, black. **Fig. 2.**

**Queensland.** BURNETT DISTRICT: Wheelbarrow Ck, Yerilgah Stn, 16 km SSE of Mt Perry, Sep 1985, *Forster* 2196 (BRI); Kingaroy, roadside of Malar Rd, Oct 1976, *Wenzel* 77 (BRI). WIDE BAY DISTRICT: Dallarnil, ca 16 km from Biggenden on the Childers Rd., *Stanley & Ross* 97 (BRI); Mothar Mountain near Gympie, Nov 1978, *Burke* 2 (BRI). MORETON DISTRICT: Eagle Heights, entrance to Palm Grove National Park, Mt Tamborine, Dec 1979, *C. Sandercoe* s.n. (BRI); roadside, N of Haigslea, NW of Ipswich, Apr 1978, *Elsol* 276 (BRI); Uni. of Qd mine, Indooroopilly, May 1984, *Conran* 164 (BRI, BRIU, NSW, MEL, PRE); 1 km NW of Tallegalla, 4 km SW of Marburg, May 1984, *Conran* 165 (BRI), Aug 1985, *Forster* 2089 (BRI); Guyatt Park, Brisbane R., St Lucia, Jun 1984, *Conran* 226 (BRI); Uni. of Qd, St Lucia, Sep 1984, *Conran* 261 (BRI).

**Ecology:** This species is most prominent in remnant semi-evergreen vine thicket/brigalow forest communities, particularly in the Marburg–Boonah districts, and is also present in many moist gullies and places of disposal for garden rubbish. The most noticeable characteristics of this exotic, is its apparent ability to outcompete and smother much of the native vegetation among which it occurs.

A study comparing the naturalised *Myrsiphyllum asparagoides* (L.) Willd. (as *Asparagus asparagoides* (L.) Wight) and the native *Clematis microphylla* DC. (Ranunculaceae) in Western Australia (Fox 1984), found that the exotic had more viable seed which germinated at higher temperatures and established faster. Fox considered that these characteristics may enable *M. asparagoides* to successfully compete with *C. microphylla*, which has obvious implications for long-term community floristic composition and eradication of the alien.

In south-eastern Queensland, it has been observed that the Silveryeye (*Zosterops lateralis lateralis* (Latham)) (M. Tucker, personal communication, 1985) and the Southern Figbird (*Sphecothebes viridis vieilloti* Vig. & Horsf.) feed on the ripe fruit of *P. africanus*. If these birds also effectively distribute the seed, the potential range for the weed is much greater than its known range, ignoring establishment and survival constraints. **Fig. 3.**

In addition, Clifford & Hamley (1982) recorded the dispersal of an *Asparagus* (*Protasparagus*) species by *Physignathus leueurii* (Gray) (Agamidae) in the Moggill area of south-eastern Queensland. Although they listed the species as *A. retrofractus*, this is uncommon in that area and the seedlings they discussed were probably those of either *P. africanus* or *P. plumosus*.

While *P. africanus* occurs primarily in disturbed communities, its presence in remnant semi-evergreen vine thicket/brigalow forest communities has implied long-term ecological and genetic consequences. These remnant patches of vegetation, although individually small in size, possess a diverse flora including several rare and endangered taxa and are in many instances the only indication of the original more widespread vegetation of the area.

Due to this diversity, it would not be advisable that widespread herbicidal use is undertaken for control. Stockard *et al.* (1985) assessing rainforest regeneration at Wingham Brush, New South Wales, found that a combination of manual removal and selected herbicidal usage, based on a flexible management approach, was reasonably successful in the control of exotic vines. This weed does not pose a major threat to agricultural productivity, and as such, infestations of it in native vegetation on private land are unlikely to receive attention from landowners. This paper aims to draw attention to this weed with the hope that interested landowners and conservationists will initiate eradication programs, while preserving the native vegetation.

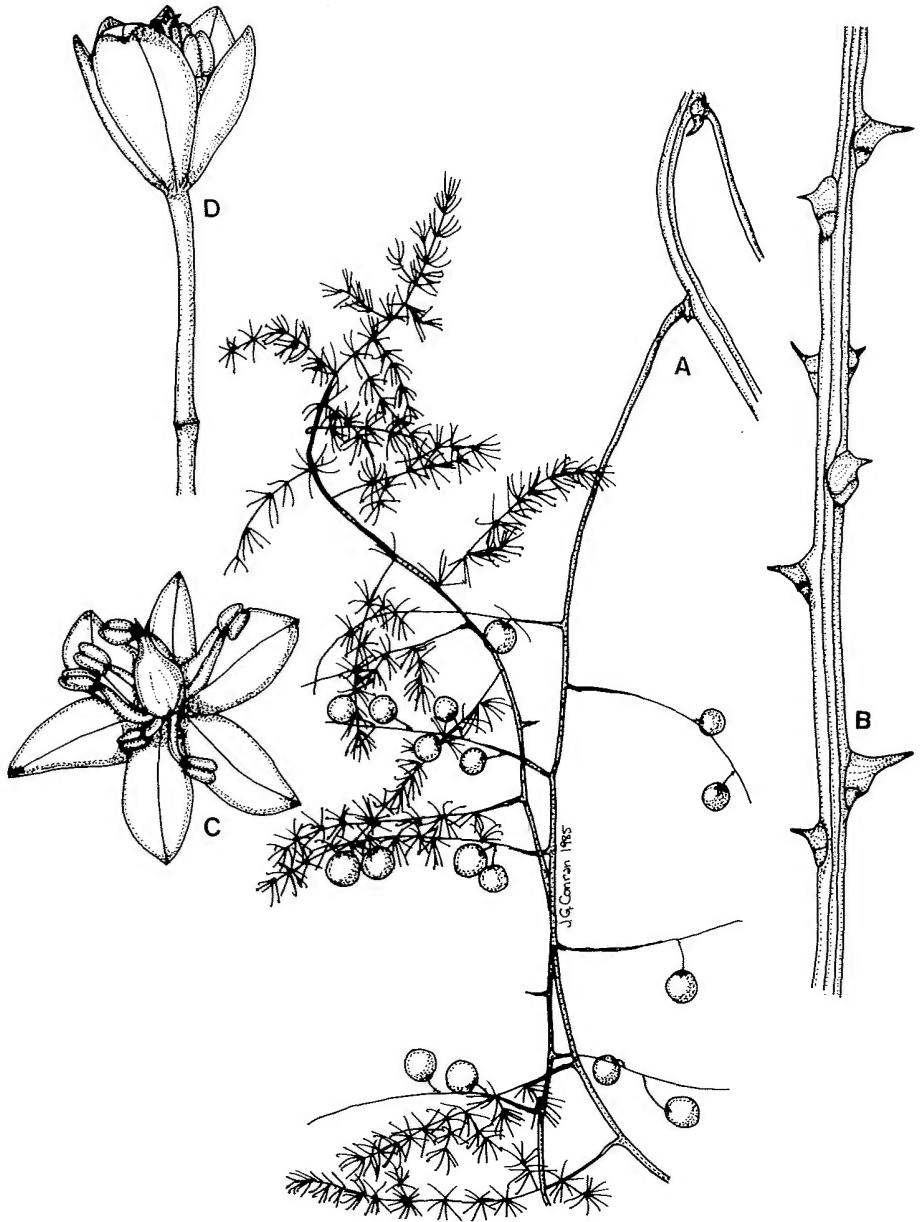


Fig. 2. *Protasparagus africanus*: A. fruiting branch  $\times 5/8$ . B. mature stem showing axillary spines  $\times 5/8$ . C. open flower  $\times 6$ . D. partially opened flower showing pedicel and well developed pericladium  $\times 6$ . All from Conran 164.



**Fig. 3.** Distribution of native avifauna known to feed on *Protasparagus africanus*, box indicates known area of naturalisation; dotted line indicates distribution of *Sphecotheres viridis* (after Ford 1975, Blakers *et al.* 1984); dashed line indicates distribution of *Zosterops lateralis* (after Blakers *et al.* 1984).

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## A NEW ALIEN *SOLANUM* L. (SOLANACEAE) IN QUEENSLAND

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### Summary

*Solanum abutiloides* (Griseb.) Bitter & Lillo, a new naturalisation record for Queensland is described.

***Solanum abutiloides*** (Griseb.) Bitter & Lillo, Repert. Spec. Nov. Regni Veg. 12: 136 (1913). Type: Near Jujuy, Argentina, Apr. 1873 Lorentz & Hieronymous 995, 1014. *n.v.* Roe (1972) cites 'prob. GOET, not seen; isotype B, as photograph F'. Morton (1976) states '995 CORD; lectotype; B, destroyed, F photo 2759'; 987 CORD; B, destroyed; 988 and 1914 B, destroyed.

Shrub or small tree 1-3 m tall, unarmed, all parts densely pubescent with abundant glandular, stellate and multangulate hairs (sessile glandular, sessile porrect stellate with long glandular central cell and multiseriate stalked multangulate hairs with glandular central cell), strongly odorous. Petiole 5-10 (-29) cm long; lamina 10-15 (-18) cm long, 10-12 (-17) cm wide, ovate acuminate, margin entire or slightly undulate, 6-7 principal lateral veins, base cordate; each leaf with two pseudostipular leaves in axil, 1.5-3 cm long, 1-3 cm wide, ovate, almost sessile or with petiole 1-3 mm long. Inflorescence at first terminal, soon displaced by an axillary shoot, peduncle 3-8 cm long to first fork, floral rachis forked further 2-3 times bearing 20 or more flowers; pedicel 5-7 mm long; calyx 7-9 mm long, deeply divided, the lobes *ca* 7 mm long, ovate-lanceolate; corolla *ca* 1 cm long, divided half its length, lobes *ca* 7 mm long, ovate-elliptic, densely pubescent outside, white; filaments 1.5-2 mm long a little dilated below, anther 4 mm long, oblong, apical pores introrse; ovary 3 mm long, oblong, densely pubescent, style 5 mm long, erect, stigma capitate greenish. Fruits numerous in an erect corymbose-cymose cluster; pedicels to 2 cm long; calyx lobes to 1 cm long, enlarged to cover base of fruit; berry *ca* 1 cm long, ovate, remaining pubescent with simple and stellate hairs, finally yellow to orange-yellow, pulpy. Seeds *ca* 1.5 mm long, discoidal, light yellowish-brown, numerous.

Original distribution in north-western Argentina and southern Bolivia, along the Cordillera Central of Bolivia and eastern Andean slopes of Argentina, Roe (1972).

**Queensland.** MORETON DISTRICT: stage two of the Mt Coot-tha Botanic Garden, Brisbane, in heavily disturbed woodland, Apr 1985, Swarbrick 8043 (AD, BRI).

Roe (1972) describes this as one of the most distinctive species in the section *Brevantherum*, which already includes the two alien species *S. erianthum* Don and *S. mauritianum* Scop. in Australia. It is readily distinguished from these by the following combination of characters.

|                       | Flower Colour   | Leaf Base        | Pseudo-stipules |
|-----------------------|-----------------|------------------|-----------------|
| <i>S. abutiloides</i> | white           | cordate          | present         |
| <i>S. erianthum</i>   | white           | rounded obtuse   | absent          |
| <i>S. mauritianum</i> | lilac to purple | acute to cuneate | present         |

Seed is often listed in Botanic Garden seed indices and it may have been grown in the Mt Coot-tha Botanic Garden at some time.



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### CORRIGENDUM

#### **Austrobaileya 2(2): 199-200 (1985)**

#### **Some historical collection localities in and around Brisbane. A. Bolin.**

Following correspondence from Mr Manfred Cross, MP, the following additions and corrections can be made:

**Ithaca Creek, Coopers Camp**—'George Cooper was the contractor who constructed the pipeline between the Enoggera Reservoir and the town of Brisbane. His camp was alongside Ithaca Creek immediately to the west of Coopers Camp Road' in the suburbs of Bardonia-Ashgrove. 27°27'S, 152°59'E.

**Peechey's Scrub**, 'was south of Enoggera Creek, in the area now surrounded by Riaweena Street, Payne Road and Whitehead Road', in the suburb of The Gap. 'Charles Peechey was the tenant of the Adsett Estate, portion 171, Parish of Enoggera'. 27°27'S, 152°56'E.

**Simpsons Gate**, 'Simpsons Creek would be West Ithaca Creek. The remains of his (Capt. Simpson's) house and an underground tank still stand on the ridge north of Sir Samuel Griffith Drive, and his gate would have been on Simpsons Road near the junction with Carwoola Street', in the suburb of Bardonia. 27°28'S, 152°58'E.









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